

<b>AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT</b>				1. CONTRACT ID CODE		PAGE OF PAGES	
2. AMENDMENT/MODIFICATION NO.		3. EFFECTIVE DATE		4. REQUISITION/PURCHASE REQ. NO.		5. PROJECT NO. <i>(If applicable)</i>	
6. ISSUED BY		CODE		7. ADMINISTERED BY <i>(If other than Item 6)</i>		CODE	
8. NAME AND ADDRESS OF CONTRACTOR <i>(No., street, county, State and ZIP Code)</i>				(X)		9A. AMENDMENT OF SOLICIATION NO.	
						9B. DATED <i>(SEE ITEM 11)</i>	
						10A. MODIFICATION OF CONTRACT/ORDER NO.	
						10B. DATED <i>(SEE ITEM 11)</i>	
CODE		FACILITY CODE					

**11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS**

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers
☐ is extended, ☐ is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing items 8 and 15, and returning \_\_\_\_\_ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. **FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER.** If by virtue of this amendment your desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA *(If required)*

**13. THIS ITEM ONLY APPLIES TO MODIFICATION OF CONTRACTS/ORDERS.  
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.**

CHECK ONE	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: <i>(Specify authority)</i> THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES <i>(such as changes in paying office, appropriation date, etc.)</i> SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
	D. OTHER <i>(Specify type of modification and authority)</i>

**E. IMPORTANT:** Contractor ☐ is not, ☐ is required to sign this document and return \_\_\_\_\_ copy to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION *(Organized by UCF section headings, including solicitation/contract subject matter where feasible.)*

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER <i>(Type or print)</i>		16A. NAME AND TITLE OF CONTRACTING OFFICER <i>(Type or print)</i>	
15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA	16C. DATE SIGNED
_____ <i>(Signature of person authorized to sign)</i>		_____ <i>(Signature of Contracting Officer)</i>	

Item 14. Continued.

### CHANGES TO AMENDMENTS

1. Amendment No. 0001.- This amendment was erroneously dated "31 December 2003." The date should read "31 December 2002." The first page of Amendment No. 0001(Standard Form 30) is reissued bearing the notation "ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-03-R-0003."

### CHANGES TO BIDDING SCHEDULE

2. Bidding Schedule: Replace the bidding schedule, pages 00010-3 through 00010-6, with the accompanying new Bidding Schedule bearing the notation "ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-03-R-0003."

### CHANGES TO SPECIFICATIONS

3. New Sections. - Add the following accompanying new section, bearing the notation "ACCOMPANYING AMENDMENT NO. 3 TO SOLICITATION NO. DACA63-03-R-0003:"

08120 ALUMINUM DOORS AND FRAMES

4. Replacement Sections. - Replace the following sections with the accompanying new sections of the same number and title, bearing the notation "ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-03-R-0003."

00100	INSTRUCTIONS TO OFFERORS
00120	PROPOSAL SUBMISSION REQUIREMENTS
01000	CONSTRUCTION SCHEDULE
02466A	DRILLED FOUNDATION CAISSONS (PIERS)
02712A	LIME-STABILIZED SUBGRADE AND BASE COURSE
06650	SOLID POLYMER (SOLID SURFACING) FABRICATIONS
10800A	TOILET ACCESSORIES
15181A	CHILLED WATER PIPING AND ACCESSORIES
15500A	DESICCANT COOLING SYSTEMS
15620A	LIQUID CHILLERS
16710A	PREMISES DISTRIBUTION SYSTEM

### CHANGES TO DRAWINGS

5. Replacement Drawings.- Replace the drawings listed below with the attached new drawings of the same number, bearing the notation "AM #0003":

G003_3.cal Seq 3	G-003	"ABBREVIATIONS, SYMBOLS, LEGENDS, MATERIAL IDENTIFICATIONS & WALL TYPES"
C002_3.cal Seq 8	C-002	PROJECT LOCATION MAP
C102_3.cal Seq 10	C-102	SITE DEMOLITION PLAN
C110_3.cal Seq 20	C-110	SITE UTILITY PLAN
C504_3.cal Seq 30	C-504	UTILITY DETAILS
A225_3.cal Seq 67	A-225	BUILDING ELEVATIONS/BUILDING SECTIONS
A333_3.cal Seq 75	A-333	WALL SECTIONS

A436_3.cal Seq 77	A-436	ENLARGED UNIT PLANS & INTERIOR ELEVATIONS
A437_3.cal Seq 78	A-437	ENLARGED TOILET PLANS & INTERIOR ELEVATIONS
A443_3.cal Seq 84	A-443	STAIR SECTIONS
A444_3.cal Seq 85	A-444	ENLARGED ELEVATOR PLANS/SECTIONS & DETAILS
A547_3.cal Seq 88	A-547	PLAN DETIALS
A648_3.cal Seq 89	A-648	ROOM FINISH SCHEDULE - COMMONS
A649_3.cal Seq 90	A-649	ROOM FINISH SCHEDULE - WING AND TYPICAL LIVING UNITS
A651_3.cal Seq 91	A-651	DOOR SCHEDULE - COMMONS
A759_3.cal Seq 99	A-759	ENLARGED ARCHITECTURAL SITE PLAN & DETAILS
SN07_3.cal Seq 107	SN-07	GRADE BEAM PROFILES
S127_3.cal Seq 128	S-127	COMMONS - SECOND FLOOR FRAMING PLAN
S128_3.cal Seq 129	S-128	COMMONS - SECOND FLOOR POST TENSIONING PLAN
M002_3.cal Seq 149	M-002	MECHANICAL SCHEDULES
M105_3.cal Seq 154	M-105	COMMONS - FIRST FLOOR HVAC PLAN
M106_3.cal Seq 155	M-106	COMMONS - SECOND FLOOR HVAC PLAN
M301_3.cal Seq 163	M-301	MECHANICAL SECTIONS
M701_3.cal Seq 170	M-701	MECHANICAL CONTROLS
M703_3.cal Seq 172	M-703	MECHANICAL CONTROLS
P105_3.cal Seq 178	P-105	COMMONS - FIRST FLOOR PLUMBING PLAN
P108_3.cal Seq 181	P-108	COMMONS - ATTIC PLUMBING PLAN
E533_3.cal Seq 220	E-533	ELECTRICAL DETAILS

END OF AMENDMENT

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15B. CONTRACTOR/OFFEROR		16B. UNITED STATES OF AMERICA	
15C. DATE SIGNED		16C. DATE SIGNED	
<i>(Signature of person authorized to sign)</i>		<i>(Signature of Contracting Officer)</i>	

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-03-R-0003

FY 2003 STUDENT DORMITORY (Title)  
 Lackland Air Force Base, Texas Location)

Solicitation No. DACA63-03-R-0003

BIDDING SCHEDULE  
 (To be attached to SF 1442)

Item No.	Description	Estimated Quantity	Unit	Unit Cost	Estimated Amount
BASE BID: All work required by the plans and specifications except BID OPTIONS specifically identified below and further described by the plans and specifications.					
0001	FY 2003 STUDENT DORMITORY building complete including all utilities to the 1524mm line of the buildings excluding all work listed separately				
		Job	Sum	***	\$_____
0002	FY 2003 STUDENT DORMITORY Site Work; All Exterior Work outside the building 1524mm line (including all utilities, earthwork, paving, sidewalk, curb and gutter, turfing, and all other work not listed separately)				
		Job	Sum	***	\$_____
0003	Drilled Piers at FY 2003 STUDENT DORMITORY				
0003AA	450mm dia. (18-In) Drilled Piers	622.2	VLM	\$_____	\$_____
0003AB	450mm dia. (18-In) Casing	300.0	VLM	\$_____	\$_____
0003AC	600mm dia. (24-In) Drilled Piers	512.4	VLM	\$_____	\$_____
0003AD	600mm dia. (24-In) Casings	200.0	VLM	\$_____	\$_____
0003AE	750mm dia. (30-In) Drilled Piers	347.7	VLM	\$_____	\$_____
0003AF	750mm dia. (30-In) Casings	110.0	VLM	\$_____	\$_____
0004	Final Record Drawings	Job	Sum	***	\$50,000.00
0005	The monetary value for warranty work, which will be retained by the Government during the warranty period as set forth in the contract, is established at 1 percent of the amount awarded for construction. This is the amount the Government will charge to or withhold from the contractor to ensure that the contractor performs the construction warranty within the timeframes specified under Contract Specifications Section 01770 CONTRACT CLOSEOUT, paragraph "Contractor's Response to Construction Warranty Service Requirements." The Government's award of this line item does not entitle the contractor to any additional compensation.				
		***	***	***	*****

TOTAL BASE BID \$\_\_\_\_\_

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-03-R-0003

Solicitation No. DACA63-03-R-0003

BIDDING SCHEDULE (cont)

0006	BID OPTION NO. 1: All work required by the plans and specifications to provide the illuminated pavilion and grilles, the illuminated concrete basketball court and the illuminated sand volleyball court.	Job	Sum	\$_____
0007	BID OPTION NO. 2: All work required by the plans and specifications to provide the package chiller unit. If this option is not accepted, the Government will furnish, install, connect and commission a chiller unit. This bid option is for the package chiller unit only; all other project components associated with the chiller installation shall remain in the base bid.	Job	Sum	\$_____
0008	BID OPTION NO. 3: All work required by the plans and specifications to provide landscape planting and landscape irrigation system. Turfing of disturbed site areas shall remain in the base bid.	Job	Sum	\$_____

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TOTAL BID (BASE BID PLUS OPTIONS) \$\_\_\_\_\_

**ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-03-R-0003**

Solicitation No. DACA63-03-R-0003

**BIDDING SCHEDULE (cont)**

**Notes:**

**1. ARITHMETIC DISCREPANCIES: (1989 JUL)**

(a) For the purpose of initial evaluation of bids, the following will be utilized in resolving arithmetic discrepancies found on the face of the bidding schedule as submitted by bidders:

(1) Obviously misplaced decimal points will be corrected;

(2) Discrepancy between unit price and extended price, the unit price will govern;

(3) Apparent errors in extension of unit prices will be corrected; and

(4) Apparent errors in addition of lump-sum and extended prices will be corrected.

(b) For the purposes of bid evaluation, the Government will proceed on the assumption that the bidder intends his bid to be evaluated on the basis of the unit prices, the totals arrived at by resolution of arithmetic discrepancies as provided above and the bid will be so reflected on the abstract of bids.

c) These Correction procedures shall not be used to resolve any ambiguity concerning which bid is low.

2. If a modification to a bid based on unit prices is submitted, which provides for a lump sum adjustment to the total estimated cost, the application of the lump sum adjustment to each unit price in the bid schedule must be stated. If it is not stated, the bidder agrees that the lump sum adjustment shall be applied on a pro rata basis to every unit price in the bid schedule.

3. Bidders must bid on all items.

4. Costs attributable to Division 01 - General Requirements are assumed to be prorated among bid items listed.

5. Responders are advised that this requirement may be delayed, canceled or revised at any time during the solicitation, selection, evaluation, negotiation and/or final award process based on decisions related to DOD changes in force structure and disposition of the Armed Services.

**6. EXERCISE OF OPTIONS (SWDR 715-1-1)**

The Government reserves the right to exercise the option(s) for up to 90 calendar days after award of the Base Bid without an increase in the Offeror's Bid Price. Completion of added options shall continue at the same schedule as the Base Bid unless otherwise noted in the CONSTRUCTION SCHEDULE, paragraph 1.1 entitled SCHEDULE.

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-03-R-0003

Solicitation No. DACA63-03-R-0003

BIDDING SCHEDULE (cont)

Notes:

7. ABBREVIATIONS

For the purposes of this solicitation, the units of measure are represented as follows:

VLM (Vertical Linear Meters)  
In (Inch)  
Mm (Millimeters)

END OF BIDDING SCHEDULE



**SECTION 00100**  
**Instructions to Offerors**

**LOCAL INSTRUCTIONS**

**PROJECT INFORMATION**

- a. For technical information regarding plans and specifications contact Fort Worth District Office, Corps of Engineers, Fort Worth, Texas, telephone, 817/886-1890, Robert Gilbert.
- b. For information regarding bidding procedures or bonds, contact Barbara Zimmer via telephone 817/886-1052; via email [Barbara.J.Zimmer@swf02.usace.army.mil](mailto:Barbara.J.Zimmer@swf02.usace.army.mil); or visit Room 2A19, 819 Taylor Street, Fort Worth, Texas. Collect calls not accepted.
- c. Offers will NOT be publicly opened. Information concerning the status of the evaluation and/or award will NOT be available after receipt of proposals.

**GENERAL NOTICES**

- a. In the technical specifications wherever the term "stabilized aggregate base course" is used, or wherever a reference is made to a section entitled "Stabilized Aggregate Base Course," it shall be deemed to mean "Aggregate Base Course."
- b. Offerors must provide full, accurate, and complete information as required by this solicitation and its attachments. The penalty for making false statements in Offers is prescribed in 18 USC 1001. (FAR 52.214-4)
- c. The Affirmative Action Requirement of the Equal Opportunity Clause may apply to any contract resulting from this RFP.

**FACSIMILE OFFERS**

For the purposes of this solicitation, *Facsimile Offers for Original submission of proposals are NOT authorized. If during the course of the evaluation phase it is determined by the Contracting Officer to allow submission of facsimile documents, these specific documents will be identified at that time.*

In the event that facsimile documents will be allowed, a fax number will be provided.

This facsimile number will be available for use by all bidders and offerors on a "first come, first served" basis and is, therefore, subject to heavy use for long periods of time. Accordingly, bidders/offerors are cautioned that "last minute" bids/offers may be received late due to heavy message traffic. The government assumes no responsibility for such late bids/offers.

**BID GUARANTEE**

Reference the provision 52.228-1, Bid Guarantee. **Facsimile Bonds are not acceptable.**

## OFFEROR'S QUALIFICATIONS

Pursuant to FAR 9.1, as an evaluation criteria, the offeror will be requested by the Government to submit a statement regarding his previous experience in performing comparable work, his business and technical organization, financial resources, and plant available to be used in performing the work.

## NOTICE REGARDING POTENTIAL EMPLOYMENT ON MILITARY INSTALLATION

If the work called for by this request for proposal is located on a military installation, offerors should check with post/base security to determine if potential employees will be allowed on the base/post to seek employment.

## SMALL BUSINESS SUBCONTRACTING PLAN

- a. This notice applies to Large Businesses only.
- b. Reference FAR 52.219-9, SMALL BUSINESS SUBCONTRACTING PLAN. The bidder/offeror shall take into consideration only those subcontracts that he/she will award when preparing the subcontracting plan required by the FAR.
- c. The Contracting Officer will NOT make award under this solicitation without an APPROVED subcontracting plan.
- d. To be approved, the plan must contain at a minimum, the eleven elements set forth in FAR 52.219-9, paragraph (d). Pursuant to AFARS 19.705-4(d), your plan will be reviewed and scored in accordance with AFARS Appendix DD to ensure it clearly represents your firm's ability to carry out the terms and conditions set forth in the contract clauses. AFARS Appendix DD (pages 201 - 207) may be accessed via the Internet at [http://acqnet.saalt.army.mil/library/AFAR/AFARS\\_OCTOBER\\_2001.pdf](http://acqnet.saalt.army.mil/library/AFAR/AFARS_OCTOBER_2001.pdf).

### Am 0003

- e. Subcontracting Plan Floors. These are the minimum percentages of subcontracted dollars that will be approved. The current floors for Fiscal Year **Am 0003 2003** are as follows:

Small Business	61.4%	<u>57.2%</u>
Small Disadvantages Business	9.1%	<u>8.9%</u>
Women-Owned Small Business	5.0%	<u>8.1%</u>
<u>Veteran-Owned and/or Service-Disabled Small Business</u>	3.0%	<u>3.0%</u>
<u>Historically Black Colleges/Universities and Minority Institutions</u>	2.0%	<u>0.0%</u>
HUBZone Small Business	2.0%	<u>3%</u>

- f. Current copies of Standard Form 294 and 295 can be found at [http://contacts.gsa.gov/webforms.nsf/\(formslist\)?openform&count=1000&category=Standard+Forms&expandview](http://contacts.gsa.gov/webforms.nsf/(formslist)?openform&count=1000&category=Standard+Forms&expandview).
- g. Contractors may post subcontracting opportunities at the Small Business Administration's SubNet: <http://web.sba.gov/subnet/index.cfm>.

## **AMENDMENTS TO THIS REQUEST FOR PROPOSALS (RFP)**

All amendments to this RFP will be made through the use of the Internet. No additional media (CD ROMS, Floppy Disks, Faxes, or paper) will be provided unless the Government determines that it is necessary. Contractors may view/download this solicitation and all amendments from the Internet after solicitation issuance at the following Internet address: <https://ebs.swf.usace.army.mil/ebs/AdvertisedSolicitations.asp>. All offerors are required to check the Ft. Worth District Contracting Division website daily to be notified of any changes to this solicitation.

## **ESTIMATED CONSTRUCTION COST**

The estimated cost of the proposed construction is between \$10,000,000 and \$25,000 000 (FAR 36.204 Disclosure of the Magnitude of Construction Projects).

## **SPECIAL NOTICE CONCERNING INDIVIDUAL SURETIES**

The Security interest, including pledged assets as set forth in the FAR 52.228-11, PLEDGES OF ASSETS, and executed Standard Form 28 entitled "AFFIDAVIT OF INDIVIDUAL SURETY" shall be furnished with the bond. Failure to provide with the bid bond a pledge of assets (security interest) in accordance with FAR 28.203-1 will result in rejection of a bid that is bonded by individual sureties.

## **PARTNERING**

In order to accomplish this contract, the government is encouraging the formation of a cohesive partnership with the contractor and its subcontractors. This partnership would strive to draw on the strengths of each organization in an effort to achieve a quality project done right the first time, within budget, and on schedule. This partnership would be bilateral in make-up and participation would be totally voluntary. Any cost associated with effectuating this partnership will be agreed to by both parties and will be shared equally with no change in contract price.

## **PRINCIPAL CONTRACTING OFFICER**

The Contracting Officer who signs this contract will be the Principal Contracting Officer for this contract. However, any Contracting Officer assigned to the Fort Worth District, contracting within his or her authority, may take formal action on this contract when a contract action needs to be taken and the Principal Contracting Officer is unavailable.

**FAR PROVISIONS**

**52.204-6 DATA UNIVERSAL NUMBERING SYSTEM (DUNS) NUMBER (JUN 99)**

(a) Contractor identification is essential for complying with statutory contract reporting requirements. Therefore, the offeror is requested to enter, in the block with its name and address on the Standard Form 33 or similar document, the annotation "DUNS" followed by the DUNS number which identifies the offeror's name and address exactly as stated in the offer.

(b) If the offeror does not have a DUNS number, it should contact Dun and Bradstreet directly to obtain one. A DUNS number will be provided immediately by telephone at no charge to the offeror. For information on obtaining a DUNS number, the offeror, if located within the United States, should call Dun and Bradstreet at 1-800-333-0505. The offeror should be prepared to provide the following information:

- (1) Company name.
- (2) Company address.
- (3) Company telephone number.
- (4) Line of business.
- (5) Chief executive officer/key manager.
- (6) Date the company was started.
- (7) Number of people employed by the company.
- (8) Company affiliation.

(c) Offerors located outside the United States may obtain the location and phone number of the local Dun and Bradstreet Information Services office from the Internet Home Page at <http://www.customerservice@dnb.com/>. If an offeror is unable to locate a local service center, it may send an e-mail to Dun and Bradstreet at [globalinfo@dnb.com](mailto:globalinfo@dnb.com).  
(End of provision)

**252.204-7001 Commercial and Government Entity (CAGE) Code Reporting. (AUG 1999)**

(a) The offeror is requested to enter its CAGE code on its offer in the block with its name and address. The CAGE code entered must be for that name and address. Enter "CAGE" before the number.

(b) If the offeror does not have a CAGE code, it may ask the Contracting Officer to request one from the Defense Logistics Information Service (DLIS). The Contracting Officer will—

- (1) Ask the Contractor to complete section B of a DD Form 2051, Request for Assignment of a Commercial and Government Entity (CAGE) Code;
- (2) Complete section A and forward the form to DLIS; and
- (3) Notify the Contractor of its assigned CAGE code.

(c) Do not delay submission of the offer pending receipt of a CAGE code.

(End of provision)

**52.211-6 Brand Name or Equal (Aug 1999)**

- (a) If an item in this solicitation is identified as "brand name or equal," the purchase description reflects the characteristics and level of quality that will satisfy the Government's needs. The salient physical, functional, or performance characteristics that "equal" products must meet are specified in the solicitation.
- (b) To be considered for award, offers of "equal" products, including "equal" products of the brand name manufacturer, must-
- (1) Meet the salient physical, functional, or performance characteristic specified in this solicitation;
  - (2) Clearly identify the item by-
    - (i) Brand name, if any; and
    - (ii) Make or model number;
  - (3) Include descriptive literature such as illustrations, drawings, or a clear reference to previously furnished descriptive data or information available to the Contracting Officer; and
  - (4) Clearly describe any modifications the offeror plans to make in a product to make it conform to the solicitation requirements. Mark any descriptive material to clearly show the modifications.
- (c) The Contracting Officer will evaluate "equal" products on the basis of information furnished by the offeror or identified in the offer and reasonably available to the Contracting Officer. The Contracting Officer is not responsible for locating or obtaining any information not identified in the offer.
- (d) Unless the offeror clearly indicates in its offer that the product being offered is an "equal" product, the offeror shall provide the brand name product referenced in the solicitation.

(End of provision)

**52.211-14 Notice of Priority Rating for National Defense Use. (Sept 1990)**

Any contract awarded as a result of this solicitation will be **DO** rated order certified for national defense use under the Defense Priorities and Allocations System (DPAS) (15 CFR 700), and the Contractor will be required to follow all of the requirements of this regulation. [*Contracting Officer check appropriate box.*]

(End of provision)

**52.0211-0002 AVAILABILITY OF SPECIFICATIONS LISTED IN THE DOD INDEX OF SPECIFICATIONS AND STANDARDS (DODISS) AND DESCRIPTIONS LISTED IN THE ACQUISITION MANAGEMENT SYSTEMS AND DATA REQUIREMENTS CONTROL LIST, DOD 5010.12-L (DEC 1999)**

Copies of specifications, standards, and data item descriptions cited in this solicitation may be obtained--

- (a) From the ASSIST database via the Internet at <http://assist.daps.mil>; or
- (b) By submitting a request to the--Department of Defense Single Stock Point (DoDSSP), Building 4, Section D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Telephone (215) 697-2667/2179, Facsimile (215) 697-1462.

(End of provision)

**52.214-34 SUBMISSION OF OFFERS IN THE ENGLISH LANGUAGE (APR 1991)**

Offers submitted in response to this solicitation shall be in the English language. Offers received in other than English shall be rejected.

(End of provision)

**52.214-35 SUBMISSION OF OFFERS IN U.S. CURRENCY (APR 1991)**

Offers submitted in response to this solicitation shall be in terms of U.S. dollars. Offers received in other than U.S. dollars shall be rejected.

(End of provision)

**52.215-1 INSTRUCTIONS TO OFFERORS--COMPETITIVE ACQUISITION (MAY 2001)**

(a) Definitions. As used in this provision--

“Discussions” are negotiations that occur after establishment of the competitive range that may, at the Contracting Officer's discretion, result in the offeror being allowed to revise its proposal.

In writing, writing, or written means any worded or numbered expression that can be read, reproduced, and later communicated, and includes electronically transmitted and stored information.

“Proposal modification” is a change made to a proposal before the solicitation's closing date and time, or made in response to an amendment, or made to correct a mistake at any time before award.

“Proposal revision” is a change to a proposal made after the solicitation closing date, at the request of or as allowed by a Contracting Officer as the result of negotiations.

“Time”, if stated as a number of days, is calculated using calendar days, unless otherwise specified, and will include Saturdays, Sundays, and legal holidays. However, if the last day falls on a Saturday, Sunday, or legal holiday, then the period shall include the next working day.

(b) Amendments to solicitations. If this solicitation is amended, all terms and conditions that are not amended remain unchanged. Offerors shall acknowledge receipt of any amendment to this solicitation by the date and time specified in the amendment(s).

(c) Submission, modification, revision, and withdrawal of proposals. (1) Unless other methods (e.g., electronic commerce or facsimile) are permitted in the solicitation, proposals and modifications to proposals shall be submitted in paper media in sealed envelopes or packages (i) addressed to the office specified in the solicitation, and (ii) showing the time and date specified for receipt, the solicitation number, and the name and address of the offeror. Offerors using commercial carriers should ensure that the proposal is marked on the outermost wrapper with the information in paragraphs (c)(1)(i) and (c)(1)(ii) of this provision.

(2) The first page of the proposal must show--

(i) The solicitation number;

(ii) The name, address, and telephone and facsimile numbers of the offeror (and electronic address if available);

(iii) A statement specifying the extent of agreement with all terms, conditions, and provisions included in the solicitation and agreement to furnish any or all items upon which prices are offered at the price set opposite each item;

(iv) Names, titles, and telephone and facsimile numbers (and electronic addresses if available) of persons authorized to negotiate on the offeror's behalf with the Government in connection with this solicitation; and

(v) Name, title, and signature of person authorized to sign the proposal. Proposals signed by an agent shall be accompanied by evidence of that agent's authority, unless that evidence has been previously furnished to the issuing office.

(3) Submission, modification, or revision, of proposals.

(i) Offerors are responsible for submitting proposals, and any modifications, or revisions, so as to reach the Government office designated in the solicitation by the time specified in the solicitation. If no time is specified in the solicitation, the time for receipt is 4:30 p.m., local time, for the designated Government office on the date that proposal or revision is due.

(ii)(A) Any proposal, modification, or revision received at the Government office designated in the solicitation after the exact time specified for receipt of offers is "late" and will not be considered unless it is received before award is made, the Contracting Officer determines that accepting the late offer would not unduly delay the acquisition; and--

(1) If it was transmitted through an electronic commerce method authorized by the solicitation, it was received at the initial point of entry to the Government infrastructure not later than 5:00 p.m. one working day prior to the date specified for receipt of proposals; or

(2) There is acceptable evidence to establish that it was received at the Government installation designated for receipt of offers and was under the Government's control prior to the time set for receipt of offers; or

(3) It is the only proposal received.

(B) However, a late modification of an otherwise successful proposal that makes its terms more favorable to the Government, will be considered at any time it is received and may be accepted.

(iii) Acceptable evidence to establish the time of receipt at the Government installation includes the time/date stamp of that installation on the proposal wrapper, other documentary evidence of receipt maintained by the installation, or oral testimony or statements of Government personnel.

(iv) If an emergency or unanticipated event interrupts normal Government processes so that proposals cannot be received at the office designated for receipt of proposals by the exact time specified in the solicitation, and urgent Government requirements preclude amendment of the solicitation, the time specified for receipt of proposals will be deemed to be extended to the same time of day specified in the solicitation on the first work day on which normal Government processes resume.

(v) Proposals may be withdrawn by written notice received at any time before award. Oral proposals in response to oral solicitations may be withdrawn orally. If the solicitation authorizes facsimile proposals, proposals may be withdrawn via facsimile received at any time before award, subject to the conditions specified in the provision at 52.215-5, Facsimile Proposals. Proposals may be withdrawn in person by an offeror or an authorized representative, if the identity of the person requesting withdrawal is established and the person signs a receipt for the proposal before award.

(4) Unless otherwise specified in the solicitation, the offeror may propose to provide any item or combination of items.

(5) Offerors shall submit proposals in response to this solicitation in English, unless otherwise permitted by the solicitation, and in U.S. dollars, unless the provision at FAR 52.225-17, Evaluation of Foreign Currency Offers, is included in the solicitation.

(6) Offerors may submit modifications to their proposals at any time before the solicitation closing date and time, and may submit modifications in response to an amendment, or to correct a mistake at any time before award.

(7) Offerors may submit revised proposals only if requested or allowed by the Contracting Officer.

(8) Proposals may be withdrawn at any time before award. Withdrawals are effective upon receipt of notice by the Contracting Officer.

(d) Offer expiration date. Proposals in response to this solicitation will be valid for the number of days specified on the solicitation cover sheet (unless a different period is proposed by the offeror).

(e) Restriction on disclosure and use of data. Offerors that include in their proposals data that they do not want disclosed to the public for any purpose, or used by the Government except for evaluation purposes, shall--

(1) Mark the title page with the following legend: This proposal includes data that shall not be disclosed outside the Government and shall not be duplicated, used, or disclosed--in whole or in part--for any purpose other than to evaluate this proposal. If, however, a contract is awarded to this offeror as a result of--or in connection with-- the submission of this data, the Government shall have the right to duplicate, use, or disclose the data to the extent provided in the resulting contract. This restriction does not limit the Government's right to use information contained in this data if it is obtained from another source without restriction. The data subject to this restriction are contained in sheets [insert numbers or other identification of sheets]; and

(2) Mark each sheet of data it wishes to restrict with the following legend: Use or disclosure of data contained on this sheet is subject to the restriction on the title page of this proposal.

(f) Contract award. (1) The Government intends to award a contract or contracts resulting from this solicitation to the responsible offeror(s) whose proposal(s) represents the best value after evaluation in accordance with the factors and subfactors in the solicitation.

(2) The Government may reject any or all proposals if such action is in the Government's interest.

(3) The Government may waive informalities and minor irregularities in proposals received.

(4) The Government intends to evaluate proposals and award a contract without discussions with offerors (except clarifications as described in FAR 15.306(a)). Therefore, the offeror's initial proposal should contain the offeror's best terms from a cost or price and technical standpoint. The Government reserves the right to conduct discussions if the Contracting Officer later determines them to be necessary. If the Contracting Officer determines that the number of proposals that would otherwise be in the competitive range exceeds the number at which an efficient competition can be conducted, the Contracting Officer may limit the number of proposals in the competitive range to the greatest number that will permit an efficient competition among the most highly rated proposals.

(5) The Government reserves the right to make an award on any item for a quantity less than the quantity offered, at the unit cost or prices offered, unless the offeror specifies otherwise in the proposal.

(6) The Government reserves the right to make multiple awards if, after considering the additional administrative costs, it is in the Government's best interest to do so.

(7) Exchanges with offerors after receipt of a proposal do not constitute a rejection or counteroffer by the Government.

(8) The Government may determine that a proposal is unacceptable if the prices proposed are materially unbalanced between line items or subline items. Unbalanced pricing exists when, despite an acceptable total evaluated price, the price of one or more contract line items is significantly overstated or understated as indicated by the application of cost or price analysis techniques. A proposal may be rejected if the Contracting Officer determines that the lack of balance poses an unacceptable risk to the Government.



(9) If a cost realism analysis is performed, cost realism may be considered by the source selection authority in evaluating performance or schedule risk.

(10) A written award or acceptance of proposal mailed or otherwise furnished to the successful offeror within the time specified in the proposal shall result in a binding contract without further action by either party.

(11) The Government may disclose the following information in postaward debriefings to other offerors:

(i) The overall evaluated cost or price and technical rating of the successful offeror;

(ii) The overall ranking of all offerors, when any ranking was developed by the agency during source selection;

(iii) A summary of the rationale for award; and

(iv) For acquisitions of commercial items, the make and model of the item to be delivered by the successful offeror.  
(End of provision)

**52.215-20 Requirements for Cost or Pricing Data or Information Other Than Cost or Pricing Data.**

(Oct 1997)

(a) *Exceptions from cost or pricing data.*

(1) In lieu of submitting cost or pricing data, offerors may submit a written request for exception by submitting the information described in the following paragraphs. The Contracting Officer may require additional supporting information, but only to the extent necessary to determine whether an exception should be granted, and whether the price is fair and reasonable.

(i) *Identification of the law or regulation establishing the price offered.* If the price is controlled under law by periodic rulings, reviews, or similar actions of a governmental body, attach a copy of the controlling document, unless it was previously submitted to the contracting office.

(ii) *Commercial item exception.* For a commercial item exception, the offeror shall submit, at a minimum, information on prices at which the same item or similar items have previously been sold in the commercial market that is adequate for evaluating the reasonableness of the price for this acquisition. Such information may include-

(A) For catalog items, a copy of or identification of the catalog and its date, or the appropriate pages for the offered items, or a statement that the catalog is on file in the buying office to which the proposal is being submitted. Provide a copy or describe current discount policies and price lists (published or unpublished), *e.g.*, wholesale, original equipment manufacturer, or reseller. Also explain the basis of each offered price and its relationship to the established catalog price, including how the proposed price relates to the price of recent sales in quantities similar to the proposed quantities;

(B) For market-priced items, the source and date or period of the market quotation or other basis for market price, the base amount, and applicable discounts. In addition, describe the nature of the market;

(C) For items included on an active Federal Supply Service Multiple Award Schedule contract, proof that an exception has been granted for the schedule item.

(2) The offeror grants the Contracting Officer or an authorized representative the right to examine, at any time before award, books, records, documents, or other directly pertinent records to verify any request for an exception under this provision, and the reasonableness of price. For items priced using catalog or market prices, or law or regulation, access does not extend to cost or profit information or other data relevant solely to the offeror's determination of the prices to be offered in the catalog or marketplace.

(b) *Requirements for cost or pricing data.* If the offeror is not granted an exception from the requirement to submit cost or pricing data, the following applies:

(1) The offeror shall prepare and submit cost or pricing data and supporting attachments in accordance with Table 15-2 of FAR 15.408.

(2) As soon as practicable after agreement on price, but before contract award (except for unpriced actions such as letter contracts), the offeror shall submit a Certificate of Current Cost or Pricing Data, as prescribed by FAR 15.406-2.

(End of provision)

**52.216-1 TYPE OF CONTRACT (APR 1984)**

The Government contemplates award of a **firm-fixed priced Construction contract** resulting from this solicitation.

(End of clause)

**52.217-5 EVALUATION OF OPTIONS (JUL 1990)**

(a) Except when it is determined in accordance with FAR 17.206(b) not to be in the Government's best interests, the Government will evaluate offers for award purposes by adding the total price for all options to the total price for the basic requirement. Evaluation of options will not obligate the Government to exercise the option(s).

(b) The Government may reject an offer as nonresponsive if it is materially unbalanced as to prices for the basic requirement and the option quantities. An offer is unbalanced when it is based on prices significantly less than cost for some work and prices that are significantly overstated for other work.

(End of provision)

**52.225-12 Notice of Buy American Act/Balance of Payments Program Requirement-Construction Materials under Trade Agreements. (Feb 2000)**

(a) *Definitions.* "Construction material," "designated country construction material," "domestic construction material," "foreign construction material," and "NAFTA country construction material," as used in this provision, are defined in the clause of this solicitation entitled "Buy American Act-Balance of Payments Program-Construction Materials under Trade Agreements" (Federal Acquisition Regulation (FAR) clause 52.225-11).

(b) *Requests for determination of inapplicability.* An offeror requesting a determination regarding the inapplicability of the Buy American Act or Balance of Payments Program should submit the request to the Contracting Officer in time to allow a determination before submission of offers. The offeror shall include the information and applicable supporting data required by paragraphs (c) and (d) of FAR clause 52.225-11 in the request. If an offeror has not requested a determination regarding the inapplicability of the Buy American Act or Balance of Payments Program before submitting its offer, or has not received a response to a previous request, the offeror shall include the information and supporting data in the offer.

(c) *Evaluation of offers.*

(1) The Government will evaluate an offer requesting exception to the requirements of the Buy American Act or Balance of Payments Program, based on claimed unreasonable cost of domestic construction materials, by adding to the offered price the appropriate percentage of the cost of such foreign construction material, as specified in paragraph (b)(4)(i) of FAR clause 52.225-11.

(2) If evaluation results in a tie between an offeror that requested the substitution of foreign construction material based on unreasonable cost and an offeror that did not request an exception, the Contracting Officer will award to the offeror that did not request an exception based on unreasonable cost.

(d) *Alternate offers.*

(1) When an offer includes foreign construction material, other than designated country or NAFTA country construction material, that is not listed by the Government in this solicitation in paragraph (b)(3) of FAR clause 52.225-11, the offeror also may submit an alternate offer based on use of equivalent domestic, designated country, or NAFTA country construction material.

(2) If an alternate offer is submitted, the offeror shall submit a separate Standard Form 1442 for the alternate offer, and a separate price comparison table prepared in accordance with paragraphs (c) and (d) of FAR clause 52.225-11 for the offer that is based on the use of any foreign construction material for which the Government has not yet determined an exception applies.

(3) If the Government determines that a particular exception requested in accordance with paragraph (c) of FAR clause 52.225-11 does not apply, the Government will evaluate only those offers based on use of the equivalent domestic, designated country, or NAFTA country construction material, and the offeror shall be required to furnish such domestic, designated country, or NAFTA country construction material. An offer based on use of the foreign construction material for which an exception was requested-

- (i) Will be rejected as nonresponsive if this acquisition is conducted by sealed bidding; or
- (ii) May be accepted if revised during negotiations.

(End of provision)

**52.233-2 SERVICE OF PROTEST (AUG 1996)**

- (a) Protests, as defined in section 33.101 of the Federal Acquisition Regulation, that are filed directly with an agency, and copies of any protests that are filed with the General Accounting Office (GAO), shall be served on the Contracting Officer (addressed as follows) by obtaining written and dated acknowledgment of receipt from

**US Army Engineer District, Fort Worth  
ATTN: CESWF-CT-C  
819 Taylor Street/PO Box 17300  
Fort Worth, TX 76102-0300**

- (b) The copy of any protest shall be received in the office designated above within one day of filing a protest with the GAO.

(End of provision)

**52.236-27 SITE VISIT (CONSTRUCTION) (FEB 1995)**

- (a) The clauses at 52.236-2, Differing Site Conditions, and 52.236-3, Site Investigations and Conditions Affecting the Work, will be included in any contract awarded as a result of this solicitation. Accordingly, offerors are urged and expected to inspect the site where the work will be performed.

- (b) Site Visits may be arranged during normal duty hours by contacting

Name: **Roger Anderson or George Cardenas**

Address: **1700 Carswell Avenue, Bldg 9050, Suite 3600, Lackland AFB, Texas**

Telephone: **210-675-7712**

(End of Provision)

**52.236-28 PREPARATION OF PROPOSALS--CONSTRUCTION (OCT 1997)**

- (a) Proposals must be (1) submitted on the forms furnished by the Government or on copies of those forms, and (2) manually signed. The person signing a proposal must initial each erasure or change appearing on any proposal form.

- (b) The proposal form may require offerors to submit proposed prices for one or more items on various bases, including--

(1) Lump sum price;

(2) Alternate prices;

(3) Units of construction; or

(4) Any combination of paragraphs (b)(1) through (b)(3) of this provision.

(c) If the solicitation requires submission of a proposal on all items, failure to do so may result in the proposal being rejected without further consideration. If a proposal on all items is not required, offerors should insert the words "no proposal" in the space provided for any item on which no price is submitted.

(d) Alternate proposals will not be considered unless this solicitation authorizes their submission.

(End of provision)

**52.252-5 AUTHORIZED DEVIATIONS IN PROVISIONS (APR 1984)**

(a) The use in this solicitation of any Federal Acquisition Regulation (48 CFR Chapter 1) provision with an authorized deviation is indicated by the addition of "(DEVIATION)" after the date of the provision.

The use in this solicitation of any Defense Federal Acquisition Regulation Supplement (DFARS) (48 CFR Chapter 2) provision with an authorized deviation is indicated by the addition of "(DEVIATION)" after the name of the regulation.

**(End of Section 00100)**

**ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-03-R-0003**

**SECTION 00120  
PROPOSAL SUBMISSION REQUIREMENTS**

**1.0 PROPOSAL.** Offerors shall strictly adhere to the requirements as set forth in this section when preparing the proposal to be submitted in response to this request for proposal (RFP).

**2.0 PROPOSAL FORMAT.**

2.1 Proposal shall be submitted in **Original plus (3) copies of the following:**

- Solicitation, Offer, and Award (SF 1442)
- Bidding Schedule (Section 00010)
- Bid Bond (Section 0500, SF 24)
- Representations and Certifications (Section 0600)
- List of the clients offeror has requested to submit a Contractor Performance Report
- Subcontracting Plan (applies to Large Businesses only). All large businesses shall submit a subcontracting plan with their proposal. The plan shall be prepared in accordance with FAR 52.219-9. Failure to submit an acceptable subcontracting plan may make an offeror ineligible for award of the contract. The submission of the subcontracting plan is in no way advantageous to large businesses over any small business in the evaluation process. A sample subcontracting plan and scoring checklist are included in this amendment. See Section 00100, paragraph entitled "Subcontracting Plan Floors" for additional information on the Fort Worth District subcontracting floors.

--- **ALL** Offerors (regardless of size) shall submit a SDB Utilization Plan, to include the following information:

- Identification of each SDB concern proposed and the **type** work each is to perform.
- Targets expressed in dollars and percentages representing each SDB concern's participation of the **total** contract value.
- **Total** target value of **all** SDB participation, expressed in dollars and percentages of the **total contract value**. (NOT "Subcontract Total")

The offeror is put on notice that any targets represented in a submitted proposal will be incorporated into and become a part of any resulting contract.

NOTE: All proposed SDB concerns must be certified by the Small Business Administration and listed in the online database PRO-Net. SDB concerns may register in PRO-Net on the Internet at the following address: <http://pronet.sba.gov>.

--- Preaward Survey Information. Offerors shall submit all preaward survey information with their proposal.

NOTE: Offerors shall notify their bank/suppliers that the Corps of Engineers may contact them, and shall authorize the bank/suppliers to release the following information regarding the Offeror's account. If a written authorization is required by their bank, Offerors shall provide that

DACA63-03-R-0003  
03 Student Dormitory  
Lackland, AFB

00120-1

**ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-03-R-0003**

authorization with their proposal.

- Name and telephone number of bank's point of contact
- Number of years business has been conducted with each bank
- Types of open accounts (checking, loans, etc.)
- Balance of current accounts (the banks will provide a "range of figures" for this information, such as, medium five-figures range)
- Means by which loans are secured and if paid as agreed
- Point of contact and telephone number of three (3) different suppliers
- Listing of current workload

**Am 03**

- 2.1.1 The envelope shall be clearly marked "**RFP No. DACA63-03-R-0003.**" **Am 03** Mail or hand carry to U.S. Army Engineer District, 819 Taylor Street, Attn: B. Zimmer, Room 2A19, Fort Worth, Texas 76102-0300.

**3.0 CONTRACTOR PERFORMANCE REPORT INFORMATION, AND EXPERIENCE.**

**3.1 Contractor Performance Reports:** Offeror shall provide information pertaining to no less than three (3) or no more than five (5) active/completed (within the last 5 years) Federal, State and local Government, and/or private contracts performed by the Offeror that are **similar in nature to the requirements in the RFP currently being evaluated**. No more than one contractor performance report form per project will be evaluated. Offerors shall provide the survey forms (Attachment B) at the end of this section (4 pages) directly to the clients the offeror desires to use as references. To be considered, the contractor performance report forms must be **completed by the client and mailed or faxed by the client directly to the Contract Specialist, Barbara Zimmer, fax 817/886-6407** to arrive by 4:00 p.m. Central Time on the date established for receipt of proposal. **!!! Contractor Performance Reports submitted directly by the offeror will not be considered. !!!**

3.1.1 The offeror is to submit with his offer, the name, phone number, fax number, and e-mail address of each individual/client the offeror has requested to complete a Contractor Performance Report.

**3.2 Experience:** Construction Contract Appraisal Support System (CCASS) reports will be retrieved by the Government and made part of the past performance evaluation. Past performance evaluation will **not** be limited to CCASS reports, Dun & Bradstreet reports, or the Contractor Performance Reports.

**FIRMS LACKING RELEVANT PAST PERFORMANCE HISTORY WILL NOT BE EVALUATED FAVORABLY OR UNFAVORABLY ON PAST PERFORMANCE.**

**ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-03-R-0003**

**3.3 Similar Experience with Another Firm.**

If the Offeror's employees have the same or similar experience as is required by this solicitation, but that experience was obtained while working for a different firm than the one with whom they are currently employed, Offeror may also submit that experience for the Government's review and evaluation. Past Performance Survey shall show the name of the current employee (Offeror), the name of the individual with the prior experience, and the name of the firm where the experience was obtained.

**(END OF SECTION 00120)**

ATTACHED at end of this section:

- A. Client Authorization Letter (1 page)
- B. Contractor Performance Report Form (4 pages)
- C. Sample Subcontracting Plan
- D. AFARS Appendix DD

## SECTION 01000

## CONSTRUCTION SCHEDULE

06/2002

AMENDMENT NO. 0003

## PART 1 GENERAL

## 1.1 SCHEDULE

Commence, prosecute, and complete the work under this contract in accordance with the following schedule and Section 00700 CONTRACT CLAUSES COMMENCEMENT, PROSECUTION AND COMPLETION OF WORK and LIQUIDATED DAMAGES:

Item of Work	Commencement of Work (calendar days)	Completion of Work (calendar days)	Liquidated Damages per calendar day_____
(1) All work	Within 10 days after receipt of Notice to Proceed	450	\$ 2070.00
(2) Establishment of Turf	*	*	---
(3) Landscaping	**	**	---

## \*Establishment of Turf

Planting and maintenance for turfing shall be in accordance with Section (AM#3) 02921A SEEDING or 02922A SODDING, as applicable. No payment will be made for establishment of turf until all requirements of the section are adequately performed and accepted, as determined by the Contracting Officer.

## \*\*Landscaping

Planting and maintenance for landscaping shall be in accordance with Section (AM#3) 02930A EXTERIOR PLANTING. No payment will be made for landscaping until all requirements of the section are adequately performed and accepted, as determined by the Contracting Officer.

## 1.1.1 Testing of Heating and Air-Conditioning Systems

The times stated for completion of this project includes all required testing specified in appropriate specification sections of heating, air conditioning and ventilation systems including HVAC Commissioning. Exception: boiler combustion efficiency test, boiler full load tests, cooling tower performance tests, and refrigeration equipment full load tests, when specified in the applicable specifications, shall be preformed



in the appropriate heating/cooling season as determined by the Contracting Officer.

1.2 TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER (OCT 1989)  
(ER 415-1-15)(52.0001-4038 1/96)

a. This provision specifies the procedure for determination of time extensions for unusually severe weather in accordance with the contract clause entitled "Default: (Fixed Price Construction)." In order for the Contracting Officer to award a time extension under this clause, the following conditions must be satisfied:

(1) The weather experienced at the project site during the contract period must be found to be unusually severe, that is, more severe than the adverse weather anticipated for the project location during any given month.

(2) The unusually severe weather must actually cause a delay to the completion of the project. The delay must be beyond the control and without the fault or negligence of the contractor.

b. The following schedule of monthly anticipated adverse weather delays due to precipitation and temperature is based on National Oceanic and Atmospheric Administration (NOAA) or similar data for the project location and will constitute the base line for monthly weather time evaluations. The contractor's progress schedule must reflect these anticipated adverse weather delays in all weather dependent activities. Wind is not considered in the Monthly Anticipated Adverse Weather Calendar Day Schedule.

MONTHLY ANTICIPATED ADVERSE WEATHER DELAY  
WORK DAYS BASED ON (5) DAY WORK WEEK

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
4	3	3	2	4	4	1	1	3	2	2	3

c. Upon acknowledgment of the Notice to Proceed (NTP) and continuing throughout the contract, the contractor will record on the daily CQC report, the occurrence of adverse weather and resultant impact to normally scheduled work. Actual adverse weather delay days must prevent work on critical activities for 50 percent or more of the contractor's scheduled work day.

The number of actual adverse weather delay days shall include days impacted by actual adverse weather (even if adverse weather occurred in previous month), be calculated chronologically from the first to the last day of each month, and be recorded as full days. If the number of actual adverse weather delay days exceeds the number of days anticipated in paragraph "b", above, the Contracting Officer will convert any qualifying delays to calendar days, giving full consideration for equivalent fair weather work days, and issue a modification in accordance with the contract clause entitled "Default (Fixed Price Construction)."

1.3 CONSTRUCTION PHASING

1.4 WORK RESTRICTIONS

1.4.1 Working Hours

Working hours shall be Monday through Friday, 0730 to 1630 hours

#### 1.4.2 Security Requirements

For the duration of this Contract, access to the Installation may be delayed between 30 minutes to an hour or more due to security precautions, including the checking of vehicle occupants' IDs, vehicle manifests, and the searching of all vehicles. Any general or specific threat to the safety of those working or living at Lackland Air Force Base could result in longer waiting times at the access points to the base..

#### 1.5 UTILITIES

##### 1.5.1 Payment for Utility Services

In accordance with Contract Clause 52.236.14 AVAILABILITY AND USE OF UTILITY SERVICES, water, gas, sewer, and electricity are not available from Government-owned and operated systems. The Contractor shall make arrangements for use and payment of utilities with the City utility company. An advance deposit for utility connection may be required.

##### 1.5.2 Coordination

a. The Contractor shall coordinate with San Antonio City Public Services (CPS) on the design and construction of gas lines to the building. CPS will provide gas service up to and including the meter. Contractor is responsible for construction within the building up to the meter. All fees and costs for the CPS work will be paid by the Contractor.

a. The Contractor shall coordinate with utility companies on the construction of gas, water, electricity, and sewer systems, including the meter. Contractor is responsible for construction from within the building up to the meter. All fees and costs for the work by the utility companies will be paid by the Contractor.

##### 1.5.3 Outages

The Contractor shall coordinate all requests for utility outages with the Contracting Officer in writing 14 days prior to date of requested outage:

- a. Water, gas, steam, and sewer outages shall be held to a maximum duration of 4 hours unless otherwise approved in writing.
- b. Electrical outages shall have a maximum duration of 4 hours.
- c. All utility outages shall be scheduled only on Saturdays, Sundays, or holidays unless specific approval is otherwise received.

#### 1.6 STREET CLOSINGS

The Contractor shall coordinate all requests for street closings with the Contracting Officer in writing 14 days prior to date of requested outage:

- a. Maximum time of outage shall be 8 hours except one lane of traffic shall be maintained at all times.
- b. The final street repair shall be completed within 14 days after the start of any street crossing. Any part of the street returned to service prior to final repair shall be maintained smooth with hot-mix cold-lay surface course.

c. Open cuts across paved roads and streets for utility crossings will not be allowed. Utility crossings will be accomplished by boring or jacking procedures only.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

-- End of Section --

## SECTION 02466A

## DRILLED FOUNDATION CAISSONS (PIERS)

12/97

## AMENDMENT NO. 0003

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 615/A 615M	(1996a) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM D 1143	(1981; R 1994e1) Piles Under Static Axial Compressive Load

## AMERICAN WELDING SOCIETY (AWS)

AWS D1.1	(1998) Structural Welding Code - Steel
AWS D1.4	(1998) Structural Welding Code - Reinforcing Steel

## 1.2 BASIS OF BID AND UNIT PRICES

## 1.2.1 Bids

The bid shall be based on the number and total length of caissons, established by top and bottom elevations and diameters, as indicated and specified. Adjustment of the contract will be made in accordance with the CONTRACT CLAUSES, should the total length of caissons installed and approved be greater or less than the total length shown. The Contractor will not be allowed payment for rejected caissons or for those not conforming to specifications.

## 1.2.2 Tests

## 1.2.2.1 Load Test

Contract shall include one (1) load test for each caisson size rated at double the design load capacity. The Contracting Officer reserves the right to increase or decrease the number of load tests. Adjustments in the contract price will be made for each such increase or decrease by the amount bid for "Additional Caisson Load Test" or "Omitted Caisson Load Test".

## 1.2.2.2 Proof Test Hole

Contract shall include 1 proof test holes. The Contracting Officer reserves the right to increase or decrease the number of proof test holes. Adjustments in the contract price will be made for each such increase or

decrease by the amount bid for "Additional Proof Test Hole" or "Omitted Proof Test Hole".

### 1.2.3 Unit Prices

#### 1.2.3.1 (AM#3) Drilled Piers

Drilled foundation piers will be measured by the linear meter for depths actually drilled in strict conformance to the requirements of the specification and drawings. The length of drilled piers will be measured from the authorized bottom of the bells or piers to their upper termination at the bottom of the grade beam, slab, pier cap, or any formed portion of the pier above grade, as applicable. Payment for drilled foundation piers will be made at the applicable contract unit price per linear meter according to diameter. This payment shall constitute full compensation for all plant, labor, materials, and all costs necessary for drilling, casing, and furnishing and placing steel and concrete, complete, except for the installation and removal of temporary casing and except for bellwork including additional concrete for bells indicated below.

##### a. Belling Piers

Payment for belling the drilled foundation piers will be included in the contract price for the structure to which the work pertains, which payment shall constitute full compensation for labor, plant, materials, and all costs necessary to enlarge the pier holes to form the bells, including concrete in the enlarged portions.

##### b. Temporary Casing

Payment for installation and removal of temporary casing when required will be measured by the linear meter from the very lowest point where originally installed to the upper termination of the grade beam, slab, pier cap, or any formed portion of the pier above grade, as applicable. Payment for casing piers will be made at the applicable contract unit price per linear meter according to diameter. This payment shall constitute full compensation for all plant, labor, materials, and all other costs necessary for installation and removal of the temporary casing.

#### 1.2.3.2 (AM#3) DELETED

#### 1.2.3.3 (AM#3) DELETED

#### 1.2.3.4 (AM#3) DELETED

#### 1.2.3.5 (AM#3) DELETED

#### 1.2.3.6 (AM#3) DELETED

#### 1.2.3.7 (AM#3) DELETED

### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-02 Shop Drawings

Caissons; G, ED

Detailed records in an approved form, for each caisson, showing shaft and bell diameters, depths of test holes, top and bottom elevations, bearing strata description, casing description, water conditions, concrete strength, concrete volume, rock elevations, dates of excavation and concrete placement, and other pertinent information. Upon completion of caisson work, the Contractor shall provide a record of centerline locations based on the survey of the registered surveyor or engineer provided by the Contractor.

In addition, corrective measures shall be similarly recorded. A complete tabulation of all records pertaining to approved caissons shall be delivered to the Contracting Officer.

## SD-06 Test Reports

Load Tests; G, ED

Test Results.

## SD-07 Certificates

Caissons; G, RE

A certified copy of the survey. Lines and levels shall be established and caisson centerline locations staked and maintained by a registered surveyor or engineer provided by the Contractor.

Qualifications; G, RE

Qualifications of the foundation system Contractor shall show that he has been engaged in the successful installation of drilled foundation caissons for at least 3 years.

## 1.4 QUALIFICATIONS

## 1.4.1 Specialty Subcontractor

The work shall be performed by a specialty subcontractor, specializing in the specified foundation system and having experience installing the specified foundation system under similar subsurface conditions.

## 1.4.2 Welding

Detail and field welding shall be in accordance with AWS D1.1. Qualification of welding procedures, welders, and welding operators shall be in accordance with AWS D1.1, Section 5. Records of test results of welding procedures not prequalified and copies of records for each qualified welding operator, containing records on positions of welding and types of electrode qualifications, shall be kept by the Contractor and be available for examination by the Contracting Officer.

## 1.5 PROJECT/SITE CONDITIONS

## 1.5.1 Subsurface Data

Subsurface soil data logs are shown on the drawings. The subsurface

investigation report and samples of materials, as taken from subsurface investigations, are available for examination at Corps of Engineers Southwest District Office, Fort Worth, Texas.

#### 1.5.2 Caisson Drilling Equipment

Caisson drilling equipment shall have the minimum torque capacity and downward force capacity for the contract site conditions.

#### 1.6 SEQUENCE OF WORK

##### 1.6.1 Caisson Excavation

Excavation of caissons or groups of caissons shall be performed so that reinforcing steel and concrete placement is a continuous operation performed the same day that the excavation is completed. Excavations shall not be left open overnight.

##### 1.6.2 Acceptance

Concrete shall be placed within 3 hours after approval of the completed excavation.

#### 1.7 SUPERVISION, INSPECTION, AND SAFETY

##### 1.7.1 Contractor Supervision

The Contractor shall provide for the supervision of all phases of drilled pier construction. Supervision shall be the Contractor's responsibility as outlined in Quality Control provisions of the SPECIAL CONTRACT REQUIREMENTS. Each drilled pier excavation shall be checked by the Contractor for its depth, water removal, cleanup, workmanship, and for all tolerance requirements before any concrete is placed.

##### 1.7.2 Government Inspection

The Contracting Officer will inspect each drilled pier excavation. Concrete shall not be placed until the excavation has been approved by the Contracting Officer. The Contractor shall furnish the Contracting Officer all necessary equipment required for proper inspection of drilled pier excavations.

##### 1.7.3 Safety Precautions for Workmen and Inspectors

###### 1.7.3.1 Life Line

Each person entering a drilled pier excavation shall be provided with a life line rigged so that the person can be immediately hoisted out of the excavation in an emergency. The life line shall be suitable for instant rescue, securely fastened to a shoulder harness, and separated from any line used to remove excavated materials. No person shall be lowered into a drilled pier excavation prior to casing the shaft through the overburden.

###### 1.7.3.2 Ventilation

Each drilled pier excavation shall be provided with a ventilating device of sufficient capacity to assure a safe and healthy atmosphere before workmen and inspectors are permitted to enter the drilled pier excavation and during all work periods.

## PART 2 PRODUCTS

### 2.1 CONCRETE WORK

Concrete work shall be in accordance with requirements of Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE, as modified herein:

#### 2.1.1 Coarse Aggregate

Maximum size of coarse aggregate shall be 38 mm.

#### 2.1.2 Reinforcing Steel

Reinforcing steel shall conform to ASTM A 615/A 615M Grade 60. Steel shall be welded into cages in accordance with AWS D1.4 and inserted securely in the caissons, in position and alignment, as shown, prior to concrete placement .

#### 2.1.3 Strength

Concrete strength shall be 21 MPa at 28 days. Slump shall be from 100 to 175 mm.

## PART 3 EXECUTION

### 3.1 PREPARATION

- a. Caissons shall be excavated to established depths and dimensions shown. Bottoms of caissons shall be cleaned of loose or soft material and leveled. Excavated material shall be disposed of in accordance with Section 02300 EARTHWORK.
- b. In drilling caissons, the surrounding soil and the earth walls shall be adequately and securely protected against cave-ins, displacement of the surrounding earth, and retention of ground water, by means of temporary steel casings. Casings shall have outside diameters not less than indicated shaft sizes, shall be a minimum of 6.4 mm (1/4 inch) thick, and shall not be removed if the structural integrity of the caisson will be impaired, as determined by the Contracting Officer. Temporary steel casings shall be withdrawn, as the concrete is being placed, maintaining sufficient head of concrete within the casing to prevent extraneous material from falling in from the sides and mixing with the concrete. Casings may be jerked upward a maximum of 100 mm to break the bottom seal, but thereafter shall be removed with a smooth, continuous motion.
- c. The inside of steel casings shall be thoroughly cleaned and oiled before reuse.
- d. The temporary casing shall be in place from the caisson top to the ground surface until the concrete has set if the elevation of the top of the caisson is below the adjacent ground surface.
- e. The outside diameter of permanent casing shall be the same as the nominal shaft diameter. Wall thickness of permanent casings shall be a minimum of 6.35 millimeters.



- f. Water that flows into the excavations shall be continuously removed and all water shall be removed from the excavation bottom, to the extent possible, prior to concrete placement. The maximum permissible depth of water will be 50 mm. In the event of a severe water condition that makes it impossible or impractical to dewater the excavation, concrete shall be placed using underwater tremie after water movement has stabilized.
- g. The bottoms of excavations indicated to be "belled" shall be enlarged to diameters and shapes shown. Bells shall be excavated or drilled in a similar manner to that used for shafts.
- h. Each caisson excavation will be inspected and approved by the Contracting Officer prior to placing concrete. A record of all inspections, with related construction changes, shall be kept by the Contractor. The Contractor shall provide support personnel for inspection and testing procedures.

### 3.2 INSTALLATION

- a. Concrete shall be continuously placed by methods that ensure against segregation and dislodging of excavation sidewalls, and shall completely fill the shaft. Concrete shall be placed by pumping or drop chutes in dry holes and by tremie or pumping in wet holes. The discharge shall be kept a minimum of 1 m below the fresh concrete surface during placement. Drilling of caissons or driving of casings shall not be within 6 m of concrete placed within the last 3 days.
- b. Concrete shall be brought to a true level surface inside the shaft and a full width cross key formed, or dowels installed, should it become necessary to interrupt placing concrete in any caisson. Prior to placing additional concrete, surfaces shall be cleaned of laitance and slush with one-to-one portland cement grout. The grout shall have a water-cement ratio not exceeding that of the concrete.
- c. Belled caissons shall be vibrated full height.

### 3.3 TOLERANCES

- a. Any caisson out of center or plumb beyond the tolerance specified shall be corrected as necessary to comply with the tolerances and the Contractor shall bear any cost of correction.
- b. Cross sections of shafts and bells shall not be less than design dimensions.
- c. Caissons shall be installed with top location deviating a maximum of 75 mm from centerline locations.
- d. Vertical caissons shall be installed plumb within a maximum of 38 mm for the first 3 m and within 13 mm for each 3 m of additional depth.

### 3.4 PROOF TEST HOLE REQUIREMENTS

Rock Soundness test shall conform to the following:

- a. After excavation, the rock below each caisson bearing level shall be proof tested for soundness by percussion or rotary core drilling one hole in each caisson in locations indicated.
- b. Holes shall be of 50 mm (2 inch) diameter and drilled with a uniform downward pressure to a depth below the bearing level equal to the design caisson shaft diameter but to a minimum of 1.2 m.
- c. Penetration time for successive 150 mm increments shall be recorded, noting conditions encountered.

The Contracting Officer will approve test holes and authorize subsequent concrete placement or initiate redesign procedures.

### 3.5 LOAD TESTS

#### 3.5.1 General Requirements

- a. Caisson load tests shall be performed in locations indicated.
- b. Tests shall be performed under supervision of a registered engineer provided by the Contractor and in the presence of the Contracting Officer. Test procedure shall be approved by the Contracting Officer prior to commencement of work.
- c. Load shall be applied in concentric manner with magnitude of load accurately determined and controlled.
- d. Top of caisson shall be laterally supported during entire load test.
- e. Load test shall be performed in accordance with ASTM D 1143, except the maximum load shall not exceed 200 percent of the design load.
- f. 3 copies of the test report shall be submitted directly to the Contracting Officer.
- g. Tested installations will be considered of adequate design and construction if:
  - (1) No apparent distress occurs in caisson construction.
  - (2) Residual settlement, after test load is removed, does not exceed 6 millimeters.
  - (3) Twice the design load does not cause a gross settlement of more than 12 millimeters.

#### 3.5.2 Replacements

Test caissons found inadequate because of improper instrumentation, testing, or construction procedures shall be replaced and retested, at no additional cost to the Government.

-- End of Section --

## SECTION 02712A

## LIME-STABILIZED SUBGRADE AND BASE COURSE

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

AASHTO M 81	(1992; R 1996) Cut-Back Asphalt (Rapid-Curing Type)
AASHTO M 82	(1975; R 1996) Cut-Back Asphalt (Medium-Curing Type)
AASHTO T 135	(1997) Wetting-and-Drying Test of Compacted Soil-Cement Mixtures
AASHTO T 136	(1997) Freezing-and-Thawing Tests of Compacted Soil-Cement Mixtures

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 25	(1999) Chemical Analysis of Limestone, Quicklime, and Hydrated Lime
ASTM C 50	(1994) Sampling, Inspection, Packing, and Marking of Lime and Limestone Products
ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 75	(1987; R 1997) Sampling Aggregates
ASTM D 422	(1963; R 1998) Particle-Size Analysis of Soils
ASTM D 490	(1992) Road Tar
ASTM D 559	(1996) Wetting and Drying Compacted Soil-Cement Mixtures
ASTM D 560	(1996) Freezing and Thawing Compacted Soil-Cement Mixtures
ASTM D 633	(1987; R 1997) Volume Correction Table for Road Tar
ASTM D 977	(1998) Emulsified Asphalt

ASTM D 1556	(1990; R 1996el) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700 kN-m/cu.m.)
ASTM D 1632	(1996) Making and Curing Soil-Cement Compression and Flexure Test Specimens in the Laboratory
ASTM D 1633	(1996) Compressive Strength of Molded Soil-Cement Cylinders
ASTM D 2027	(1976; R 1997) Cutback Asphalt (Medium-Curing Type)
ASTM D 2028	(1976; R 1997) Cutback Asphalt (Rapid-Curing Type)
ASTM D 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2922	(1996el) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R 1996el) Water Content of Soil and Rock in Place By Nuclear Methods (Shallow Depth)
ASTM D 4318	(1998) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM E 11	(1995) Wire-Cloth Sieves for Testing Purposes

## 1.2 DEFINITIONS

### 1.2.1 Lime-Stabilized Course

Lime-stabilized course, as used in this specification, is a mixture of lime and in-place or select borrow material uniformly blended, wetted, and thoroughly compacted to produce a pavement course which meets the criteria set forth in the plans and this specification.

### 1.2.2 Degree of Compaction

Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 abbreviated as percent laboratory maximum density.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-03 Product Data

Plant, Equipment, Machines, and Tools; G  
Mix Design; G

List of proposed equipment to be used in performance of construction work including descriptive data. Mix design at least 30 days before it is to be used.

## SD-06 Test Reports

Sampling and Testing; G  
Field Density; G

Calibration curves and related test results prior to using the device or equipment being calibrated. Copies of field test results within 48 hours after the tests are performed. Certified copies of test results of materials and sources not less than 30 days before material is required for the work.

1.4 ~~[AM0003]MEASUREMENT FOR PAYMENT~~1.4.1 ~~Lime Stabilization~~

~~Measurement will be by the square meter of work completed and accepted.~~

1.4.2 ~~Lime~~

~~Measurement will be by the number of metric tons of lime used in the completed and accepted work. No measurement will be made for wasted lime or lime used in work determined defective.~~

1.4.3 ~~Bituminous Material~~

~~Bituminous material to be paid for will be measured in the number of liters of the material used in the accepted work, corrected to liters at 16 degrees C in accordance with ASTM D 633. A coefficient of 0.000139 per degree C (0.00025 per degree F) shall be used for asphalt emulsion.~~

1.4.4 ~~Select Material~~

~~Select material will be measured by the metric ton of material placed and used in the completed and accepted stabilization. No measurement will be made for select material that is wasted or used in work determined defective.~~

1.5 ~~[AM0003]BASIS FOR PAYMENT~~

~~Lime stabilization, constructed and accepted, including lime, and select material will be paid for at the respective contract unit prices in the bidding schedule. No payment will be made for any material wasted, used for the convenience of the Contractor, unused or rejected, or for water used. Select material obtained from grading and excavation operations at the project site will not be paid for under this section but will be included for payment under other sections specifying grading and excavating.~~

## 1.6 JOB DESCRIPTION

The work specified consists of the construction of a lime-stabilized base and subgrade course. The work shall be performed in accordance with this specification and shall conform to the lines, grades, notes, and typical sections shown in the drawings. Sources of materials shall be selected well in advance of the time when materials will be required in the work.

#### 1.7 STOCKPILING MATERIALS

Select material, including approved material available from excavation and grading, shall be stockpiled in the manner and at the locations designated. Before stockpiling material, storage sites shall be cleared and sloped to drain. Materials obtained from different sources shall be stockpiled separately.

#### 1.8 PLANT, EQUIPMENT, MACHINES, AND TOOLS

##### 1.8.1 General Requisites

Plant, equipment, machines, and tools used in the work shall be subject to approval and shall be maintained in satisfactory working condition at all times. Other compacting equipment may be used in lieu of that specified, where it can be demonstrated that the results are equivalent. Protective equipment, apparel, and barriers shall be provided to protect the eyes, respiratory system, and the skin of workers exposed to contact with lime dust or slurry.

##### 1.8.2 Steel-Wheeled Rollers

Steel-wheeled rollers shall be the self-propelled type with a total weight of not less than 9 metric tons, and a minimum weight of 135 kilograms per millimeter width of rear wheel. Wheels of the rollers shall be equipped with adjustable scrapers. The use of vibratory rollers is optional.

##### 1.8.3 Mechanical Spreader

Mechanical spreader shall be self-propelled or attached to a propelling unit capable of moving the spreader and material truck. The device shall be steerable and shall have variable speeds forward and reverse. The spreader and propelling unit shall be carried on tracks, rubber tires, or drum-type steel rollers that will not disturb the underlying material. The spreader shall contain a hopper, an adjustable screed, and outboard bumper rolls; and shall be designed to have a uniform, steady flow of material from the hopper. The spreader shall be capable of laying material without segregation across the full width of the lane to a uniform thickness and to a uniform loose density so that when compacted, the layer or layers shall conform to thickness and grade requirements indicated. The Contracting Officer may require a demonstration of the spreader prior to approving use in performance of the work.

##### 1.8.4 Sprinkling Equipment

Sprinkling equipment shall consist of tank trucks, pressure distributors, or other approved equipment designed to apply controlled quantities of water uniformly over variable widths of surface.

##### 1.8.5 Tampers

Tampers shall be of an approved mechanical type, operated by either

pneumatic pressure or internal combustion, and shall have sufficient weight and striking power to produce the compaction required.

#### 1.8.6 Straightedge

The Contractor shall furnish and maintain at the site, in good condition, one 3.66 meters straightedge for each bituminous paver, for use in the testing of the finished surface. Straightedge shall be made available for Government use. Straightedges shall be constructed of aluminum or other lightweight metal and shall have blades of box or box-girder cross section with flat bottom reinforced to insure rigidity and accuracy. Straightedges shall have handles to facilitate movement on pavement.

#### 1.9 WEATHER LIMITATIONS

Work on the base course shall not be performed during freezing temperatures. When the temperature is below 5 degrees C, the completed base course shall be protected against freezing by a sufficient covering of straw, or by other approved methods, until the course has dried out. Any areas of completed base course that are damaged by freezing, rainfall, or other weather conditions shall be brought to a satisfactory condition without additional cost to the Government. Lime shall not be applied when the atmospheric temperature is less than 5 degrees C. No lime shall be applied to soils that are frozen or contain frost, or when the underlying material is frozen. If the temperature falls below 2 degrees C, completed lime-treated areas shall be protected against any detrimental effects of freezing.

### PART 2 PRODUCTS

#### 2.1 MATERIALS

##### 2.1.1 Lime

Lime shall be a standard brand of hydrated lime conforming to the following physical and chemical requirements:

- a. Lime shall be of such gradation that 99-1/2 percent passes a 0.850 mm sieve and a minimum of 85 percent passes a 0.150 mm sieve.
- b. Combined calcium oxide and magnesium oxide shall be not less than 92 percent .

##### 2.1.2 Water

Water shall be clean, fresh, and free from injurious amounts of oil, acid, salt, alkali, organic matter, and other substances deleterious to the lime or soil-lime mixture, and shall be subject to approval.

#### 2.2 MIX DESIGN

The Contractor shall develop and submit for approval a proposed mix design prior to stabilization work. Mix shall be developed using samples of the material to be stabilized. Mix shall as a minimum consist of 6% lime by weight of dry soil. Mix design shall be capable of producing a compressive strength of 1.035 MPa when compacted to the design percent of laboratory maximum density. Samples shall not show any significant loss of strength after 12 cycles of the durability test.

## PART 3 EXECUTION

## 3.1 LIME STABILIZATION MIXTURE

The material to be stabilized shall be thoroughly pulverized and, when lime is applied in the dry state, the mix shall be thoroughly blended at a moisture content below optimum. After mixing is completed, the proportions of the mixture shall be in accordance with the approved mix design. After blending, water shall be blended into the dry mix in amounts necessary to bring the moisture content to optimum. Field moisture content shall be controlled within plus or minus 2 percent of optimum. When the stabilized course is constructed in more than one layer, the previously constructed layer shall be cleaned of loose and foreign matter by sweeping with power sweeper or power brooms except that hand brooms may be used in areas where power cleaning is not practicable. Adequate drainage shall be provided during the entire construction period to prevent water from collecting or standing on the area to be stabilized or on pulverized, mixed, or partially mixed material. Line and grade stakes shall be provided as necessary for control. Grade stakes shall be in lines parallel to the centerline of the area under construction and suitably spaced for string lining.

## 3.2 OPERATION OF BORROW PITS

Borrow pits shall be cleared, stripped and excavated in a manner that exposes vertical faces of the deposit for suitable working depths. Strata of unsuitable materials overlying or occurring in the deposit shall be wasted. Methods of operating pits and the processing and blending of materials may be changed or modified if necessary to obtain material conforming to the specified requirements. Upon completion of the work, pits shall be conditioned to drain readily, and be left in a satisfactory condition.

## 3.3 PREPARATION OF AREA TO BE STABILIZED

The area shall be cleaned of debris. The area will be inspected for adequate compaction and shall be capable of withstanding, without displacement, the compaction specified for the soil-lime mixture. Debris and removed unsatisfactory in-place material shall be disposed of as specified.

## 3.3.1 In-Place Material to be Stabilized

The entire area shall be graded to conform to the lines, grades, and cross sections shown in the plans prior to being processed. Soft or yielding subgrade areas shall be made stable before construction is begun.

## 3.3.2 In-Place Material to Receive Stabilized Course

Subgrade shall conform to Section 02300 EARTHWORK.

## 3.3.3 Quantity of Select Material

Where in-place mixing is to be accomplished, the soil shall be graded and shaped to the approximate section and grade shown before lime stabilization is undertaken.

## 3.3.4 Grade Control

Underlying material shall be excavated to sufficient depth for the required



stabilized-course thickness so that the finished stabilized course with the subsequent surface course will meet the fixed grade. Finished and completed stabilized area shall conform to the lines, grades, cross section, and dimensions indicated.

### 3.4 INSTALLATION

#### 3.4.1 Mixed In-Place Method

##### 3.4.1.1 Scarifying and Pulverizing of Soil

Prior to application of lime, the soil shall be scarified and pulverized to a depth of 150 millimeters. Scarification shall be controlled so that the layer beneath the layer to be treated is not disturbed. Depth of pulverizing shall not exceed the depth of scarification.

##### 3.4.1.2 Application of Lime

Pulverized material shall be shaped to approximately the cross section indicated. Lime shall be applied so that when uniformly mixed with the soil, the specified lime content is obtained, and a sufficient quantity of lime-treated soil is produced to construct a compacted lime-treated course conforming to the lines, grades, and cross section indicated. Mechanical spreaders shall be used in applying bulk lime. Distributors shall be used in applying slurry. If lime is spread by hand, the bags shall be spotted accurately on the area being stabilized so that when the bags are opened the lime will be dumped and spread uniformly on the area being processed. No equipment except that used in spreading and mixing shall pass over the freshly applied lime.

##### 3.4.1.3 Initial Mixing

Immediately after the lime has been distributed, the lime and soil shall be mixed. Initial mixing shall be sufficient to alleviate any dusting or wetting of the lime that might occur in the event of wind or rainstorms. This may be accomplished several days in advance of the final application and mixing.

##### 3.4.1.4 Water Application and Moist Mixing

Moisture content of the mixture shall be determined in preparation for final mixing. Moisture in the mixture following final mixing shall not be less than the water content determined to be optimum based on dry weight of soil and shall not exceed the optimum water content by more than 2 percentage points. Water may be added in increments as large as the equipment will permit; however, such increment of water shall be partially incorporated in the mix to avoid concentration of water near the surface. After the last increment of water has been added, mixing shall be continued until the water is uniformly distributed throughout the full depth of the mixture, including satisfactory moisture distribution along the edges of the section.

#### 3.4.2 Edges of Stabilized Course

Approved material shall be placed along the edges of the stabilized course in a quantity that will compact to the thickness of the course being constructed, or to the thickness of each layer in a multiple-layer course, allowing at least a 300 mm width of the shoulder to be rolled and compacted simultaneously with the rolling and compacting of each layer of

the stabilized course.

#### 3.4.3 Central-Plant Method

Plant shall be capable of producing a uniform lime-treated mixture at the specified lime and moisture contents. Mixture shall be hauled to the job in trucks equipped with protective covers. Underlying course shall be thoroughly moistened and the mixture then placed on the prepared area in a uniform layer with mechanical spreaders. The layer shall be uniform in thickness and surface contour; and the completed layer, after compaction, shall conform to the required grade and cross section.

#### 3.4.4 Traveling-Plant Method

Traveling plant shall move at a uniform rate of speed and shall accomplish thorough mixing of the materials in one pass. Water and lime shall be delivered from supply trucks or bins at a predetermined rate. Windrows of prepared soil-lime mixture shall cover a predetermined width to the indicated compacted thickness.

#### 3.4.5 Layer Thickness

Compacted thickness of the stabilized course shall be 150 millimeters. No layer shall be more than 200 mm or less than 75 mm in compacted thickness.

#### 3.4.6 Compaction

Before compaction operations are started and as a continuation of the mixing operation, the mixture shall be thoroughly loosened and pulverized to the full depth. Compaction shall be started immediately after mixing is completed. During final compaction, the surface shall be moistened, if necessary, and shaped to the required lines, grades, and cross section. Density of compacted mixture shall be at least 95 percent of laboratory maximum density. Rolling shall begin at the outside edge of the surface and proceed to the center, overlapping on successive trips at least one-half the width of the roller. Alternate trips of the roller shall be slightly different lengths. At all times, the speed of the roller shall not cause displacement of the mixture to occur. Areas inaccessible to the rollers shall be compacted with mechanical tampers, and shall be shaped and finished by hand methods.

#### 3.4.7 Finishing

The surface of the top layer shall be finished to the grade and cross section shown. The surface shall be of uniform texture. Light blading during rolling may be necessary for the finished surface to conform to the lines, grades, and cross sections. If the surface for any reason becomes rough, corrugated, uneven in texture, or traffic-marked prior to completion, the unsatisfactory portions shall be scarified, reworked, relaid, or replaced as directed. If any portion of the course, when laid, becomes water-soaked for any reason, that portion shall be removed immediately, and the mix placed in a windrow and aerated until a moisture content within the limits specified is obtained; and then spread, shaped, and rolled as specified above.

#### 3.4.8 Construction Joints

At the end of each phase of construction, a straight transverse construction joint shall be formed by cutting back into the completed work

to form a true vertical face free of loose or shattered material. Material along construction joints not properly compacted shall be removed and replaced with soil-lime mixture that is mixed, moistened, and compacted as specified.

#### 3.4.9 Curing and Protection

Immediately after the soil-lime area has been finished as specified above, the surface shall be protected against rapid drying for 7 days by one of the methods specified below .

##### 3.4.9.1 Moist Curing

The area shall be moistened by sprinkling and shall be kept moist for the 7-day curing period.

#### 3.5 SAMPLING AND TESTING

##### 3.5.1 General Requirements

Sampling and testing shall be performed by an approved commercial testing laboratory or by facilities furnished by the Contractor. Work requiring testing will not be permitted until the facilities have been inspected and approved. The first inspection will be at the expense of the Government. Cost incurred for any subsequent inspection required because of failure of the facilities to pass the first inspection will be charged to the Contractor. Tests shall be performed in sufficient numbers and at the locations and times directed to ensure that materials and compaction meet specified requirements. Certified copies of the test results shall be furnished to the Contracting Officer.

##### 3.5.2 Results

Results shall verify that the material complies with the specification. When the source of materials is changed or deficiencies are found, the initial analysis shall be repeated and the material already placed shall be retested to determine the extent of unacceptable material. All in-place unacceptable material shall be replaced.

##### 3.5.3 Sampling

All aggregate samples for laboratory testing shall be taken in accordance with ASTM D 75. Samples of lime shall be taken in accordance with ASTM C 50. Specimens for the unconfined compression tests shall be prepared in accordance with ASTM D 1632.

##### 3.5.4 Sieve Analysis

Before starting work, one sample of material to be stabilized shall be tested in accordance with ASTM C 136 and ASTM D 422 on sieves conforming to ASTM E 11. After the initial test, a minimum of one analysis shall be performed for each 500 metric tons of material placed, with a minimum of three analyses for each day's run until the course is completed.

##### 3.5.5 Liquid Limit and Plasticity Index

One liquid limit and plasticity index shall be performed for each sieve analysis. Liquid limit and plasticity index shall be in accordance with ASTM D 4318.

### 3.5.6 Chemical Analysis

Lime shall be tested for the specified chemical requirements in accordance with ASTM C 25. Three tests shall be conducted for each delivery of lime.

### 3.5.7 Testing

Unconfined compression tests shall be conducted in accordance with ASTM D 1633. Three tests shall be conducted for each mix design tested. Samples shall be cured at a constant moisture content and temperature for 28 days. Three tests shall be conducted for each mix design tested. Scratch portion of the test shall be omitted.

## 3.6 FIELD QUALITY CONTROL

Tests shall provide a moisture-density relationship for the lime-soil mixture. Results of field quality control testing shall verify that materials comply with this specification. When a material source is changed, the new material shall be tested for compliance. When deficiencies are found, the initial analysis shall be repeated and the material already placed shall be retested to determine the extent of unacceptable material. All in-place unacceptable material shall be replaced or repaired, as directed by the Contracting Officer, at no additional cost to the Government.

### 3.6.1 Thickness Control

Completed thicknesses of the stabilized course shall be within 13 mm (1/2 inch) of the thickness indicated. Where the measured thickness of the stabilized course is more than 13 mm (1/2 inch) deficient, such areas shall be corrected by scarifying, adding mixture of proper gradation, reblading, and recompact as directed. Where the measured thickness of the stabilized course is more than 13 mm (1/2 inch) thicker than indicated, it shall be considered as conforming to the specified thickness requirement. Average job thickness shall be the average of all thickness measurements taken for the job, but shall be within 6 mm (1/4 inch) of the thickness indicated. Thickness of the stabilized course shall be measured at intervals which ensure one measurement for each 500 square meters of stabilized course. Measurements shall be made in 75 mm (3 inch) diameter test holes penetrating the stabilized course.

### 3.6.2 Field Density

Field in-place density shall be determined in accordance with ASTM D 1556 or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked, and adjusted if necessary, using the sand cone method as described in paragraph Calibration of the ASTM publication. ASTM D 2922 results in a wet unit weight of soil and when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D 3017. If ASTM D 2922 is used, in-place densities shall be checked by ASTM D 1556 at least once per lift for each 500 square meter of stabilized material. Calibration curves and calibration tests results shall be furnished to the Contracting Officer within 24 hours of conclusion of the tests. At least one field density test shall be performed for each 250 square meters of each layer of base material.

### 3.7 TRAFFIC

Completed portions of the lime-treated soil area may be opened immediately to light traffic provided the curing is not impaired. After the curing period has elapsed, completed areas may be opened to all traffic, provided the stabilized course has hardened sufficiently to prevent marring or distorting of the surface by equipment or traffic. Heavy equipment shall not be permitted on the area during the curing period. Lime and water may be hauled over the completed area with pneumatic-tired equipment if approved. Finished portions of lime-stabilized soil that are traveled on by equipment used in constructing an adjoining section shall be protected in a manner to prevent equipment from marring or damaging completed work.

### 3.8 MAINTENANCE

Stabilized area shall be maintained in a satisfactory condition until the completed work is accepted. Maintenance shall include immediate repairs of any defects and shall be repeated as often as necessary to keep the area intact. Defects shall be corrected as specified herein.

### 3.9 DISPOSAL OF UNSATISFACTORY MATERIALS

Removed in-place materials that are unsuitable for stabilization, material that is removed for the required correction of defective areas, waste material, and debris shall be disposed of off site.

-- End of Section --

## SECTION 06650

## SOLID POLYMER (SOLID SURFACING) FABRICATIONS

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A136.1	(1992) Organic Adhesives for Installation of Ceramic Tile
ANSI Z124.3	(1995) Plastic Lavatories
ANSI Z124.6	(1997) Plastic Sinks

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 570	(1998) Water Absorption of Plastics
ASTM D 638	(1999) Tensile Properties of Plastics
ASTM D 638M	(1998) Tensile Properties of Plastics (Metric)
ASTM D 696	(1998) Coefficient of Linear Thermal Expansion of Plastics Between Minus 30 degrees C and 30 degrees C
ASTM D 2583	(1995) Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
ASTM E 84	(1999) Surface Burning Characteristics of Building Materials
ASTM G 21	(1996) Determining Resistance of Synthetic Polymeric Materials to Fungi
ASTM G 22	(1976; R 1996) Determining Resistance of Plastics to Bacteria

## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA LD 3	(1995) High Pressure Decorative Laminates
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## 1.2 GENERAL DESCRIPTION

Work in this section includes counter tops, lavatories, window stools, toilet partitions, and other items utilizing solid polymer (solid surfacing) fabrication as shown on the drawings and as described in this

specification.

### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-02 Shop Drawings

Shop Drawings; G  
Installation;

Shop Drawings indicating locations, dimensions, component sizes, fabrication and joint details, attachment provisions, installation details, and coordination requirements with adjacent work.

#### SD-03 Product Data

Solid polymer material; G  
Qualifications;  
Fabrications;

Product data indicating product description, fabrication information, and compliance with specified performance requirements for solid polymer, joint adhesive, sealants, and heat reflective tape. Both the manufacturer of materials and the fabricator shall submit a detailed description of operations and processes in place that support efficient use of natural resources, energy efficiency, emissions of ozone depleting chemicals, management of water and operational waste, indoor environmental quality, and other production techniques supporting sustainable design and products.

#### SD-04 Samples

Material; G

A minimum 100 by 100 mm sample of each color and pattern for approval. Samples shall indicate full range of color and pattern variation. Approved samples shall be retained as a standard for this work.

#### SD-06 Test Reports

Solid polymer material;

Test report results from an independent testing laboratory attesting that the submitted solid polymer material meets or exceeds each of the specified performance requirements.

#### SD-10 Operations and Maintenance Data

Solid polymer material  
Clean-up

A minimum of six copies of maintenance data indicating manufacturer's care, repair and cleaning instructions. Maintenance

video shall be provided, if available. Maintenance kit for matte finishes shall be submitted.

#### 1.4 DELIVERY, STORAGE AND HANDLING

Materials shall not be delivered to project site until areas are ready for installation. Materials shall be stored indoors and adequate precautions taken to prevent damage to finished surfaces. Protective coverings shall be provided to prevent physical damage or staining following installation, for duration of project.

#### 1.5 WARRANTY

Manufacturer's warranty of ten years against defects in materials, excluding damages caused by physical or chemical abuse or excessive heat, shall be provided. Warranty shall provide for material and labor for replacement or repair of defective material for a period of ten years after component installation.

#### 1.6 QUALIFICATIONS

To insure warranty coverage, solid polymer fabricators shall be certified to fabricate by the solid polymer material manufacturer being utilized. All fabrications shall be marked with the fabricator's certification label affixed in an inconspicuous location. Fabricators shall have a minimum of 5 years of experience working with solid polymer materials.

#### 1.7 MOCK-UP

Prior to final approval of shop drawings, a full-size mock-up shall be provided of a typical vanity top and countertop where multiple units are required. The mock-up shall include all solid polymer components required to provide a completed unit. The mock-up shall utilize finishes in patterns and colors indicated on the drawings. Should the mock-up not be approved, the Contractor shall re-work or remake it until approval is secured. Rejected units shall be removed from the jobsite. Approved mock-up may remain as part of the finished work.

### PART 2 PRODUCTS

#### 2.1 MATERIAL

Solid polymer material shall be a homogeneous filled solid polymer; not coated, laminated or of a composite construction; meeting ANSI Z124.3 and ANSI Z124.6 requirements. Material shall have minimum physical and performance properties specified. Superficial damage to a depth of 0.25 mm shall be repairable by sanding or polishing. Material thickness shall be as indicated on the drawings. In no case shall material be less than 6 mm in thickness.

##### 2.1.1 Cast, 100 Percent Acrylic Polymer Solid Surfacing Material

Cast, 100 percent acrylic solid polymer material shall be composed of acrylic polymer, mineral fillers, and pigments and shall meet the following minimum performance requirements:



PROPERTY	REQUIREMENT (min. or max.)	TEST PROCEDURE
Tensile Strength	422 kg/cm <sup>2</sup>	ASTM D 638M
Hardness	55-Barcol Impressor (min.)	ASTM D 2583
Thermal Expansion	.0000386cm/cm/degC	ASTM D 696
Boiling water Surface Resistance	No Change	NEMA LD 3-3.05
High Temperature Resistance	No Change	NEMA LD 3-3.06
Impact Resistance (Ball drop)		NEMA LD 3-303
6.4 mm sheet	910 mm, 227 g ball, no failure	
12.7 mm sheet	3550 mm, 227 g ball, no failure	
19 mm sheet	5070 mm, 227 m ball, no failure	
Mold & Mildew Growth	No growth	ASTM G 21
Bacteria Growth	No Growth	ASTM G 22
Liquid Absorption (Weight in 24 hrs.)	0.1% max.	ASTM D 570
Flammability		ASTM E 84
Flame Spread	25 max.	
Smoke Developed	30 max	

#### 2.1.2 Material Patterns and Colors

Patterns and colors for all solid polymer components and fabrications shall be those indicated on the project drawings or color schedule. Pattern and color shall occur, and shall be consistent in appearance, throughout the entire depth (thickness) of the solid polymer material.

#### 2.1.3 Surface Finish

Exposed finished surfaces and edges shall receive a uniform appearance. Exposed surface finish shall be matte; gloss rating of 5-20 .

#### 2.2 ACCESSORY PRODUCTS

Accessory products, as specified below, shall be manufactured by the solid polymer manufacturer or shall be products approved by the solid polymer manufacturer for use with the solid polymer materials being specified.

### 2.2.1 Seam Adhesive

Seam adhesive shall be a two-part adhesive kit to create permanent, inconspicuous, non-porous, hard seams and joints by chemical bond between solid polymer materials and components to create a monolithic appearance of the fabrication. Adhesive shall be approved by the solid polymer manufacturer. Adhesive shall be color-matched to the surfaces being bonded where solid-colored, solid polymer materials are being bonded together. The seam adhesive shall be clear or color matched where particulate patterned, solid polymer materials are being bonded together.

### 2.2.2 Panel Adhesive

Panel adhesive shall be neoprene based panel adhesive meeting ANSI A136.1, Underwriter's Laboratories (UL) listed. This adhesive shall be used to bond solid polymer components to adjacent and underlying substrates.

### 2.2.3 Silicone Sealant

Sealant shall be a mildew-resistant, FDA and UL listed silicone sealant or caulk in a clear formulation. The silicone sealant shall be approved for use by the solid polymer manufacturer. Sealant shall be used to seal all expansion joints between solid polymer components and all joints between solid polymer components and other adjacent surfaces such as walls, floors, ceiling, and plumbing fixtures.

### 2.2.4 Conductive Tape

Conductive tape shall be manufacturer's standard foil tape, 4 mils thick, applied around the edges of cut outs containing hot or cold appliances.

## 2.3 FABRICATIONS

Components shall be factory or shop fabricated to the greatest extent practical to sizes and shapes indicated, in accordance with approved Shop Drawings and manufacturer's requirements. Factory cutouts shall be provided for sinks, lavatories, and plumbing fixtures where indicated on the drawings. Contours and radii shall be routed to template, with edges smooth. Defective and inaccurate work will be rejected.

### 2.3.1 Joints and Seams

Joints and seams shall be formed between solid polymer components using manufacturer's approved seam adhesive. Joints shall be inconspicuous in appearance and without voids to create a monolithic appearance.

### 2.3.2 Edge Finishing

Rout and finish component edges to a smooth, uniform appearance and finish. Edge shapes and treatments, including any inserts, shall be as detailed on the drawings. Rout all cutouts, then sand all edges smooth. Repair or reject defective or inaccurate work.

### 2.3.3 Counter and Vanity Top Splashes

Backsplashes and end splashes shall be fabricated from 13 mm thick solid surfacing material and shall be 100 mm high. Backsplashes and end splashes shall be provided at locations indicated on the drawings.

Backsplashes shall be shop fabricated and be permanently attached .

#### 2.3.3.1 Permanently Attached Backsplash

Permanently attached backsplashes shall be attached with seam adhesive and to form a radiused coved transition from countertop to backsplash.

#### 2.3.3.2 End Splashes

End splashes shall be provided loose for installation at the jobsite after horizontal surfaces to which they are to be attached have been installed.

#### 2.3.4 Window Stools

Window stools shall be fabricated from 13 mm thick solid surfacing, solid polymer material. Dimensions, edge shape, and other details shall be as indicated on the drawings .

#### 2.3.5 Counter and Vanity Tops

All solid surfacing, solid polymer counter top and vanity top components shall be fabricated from 13 mm thick material. Edge details, dimensions, locations, and quantities shall be as indicated on the Drawings. Counter tops shall be complete with 100 mm high permanently attached with coved transition backsplash and loose endsplashes where indicated on the drawings. Attach 50 mm wide reinforcing strip of polymer material under each horizontal counter top seam.

##### 2.3.5.1 Vanity Tops With Bowls

###### A. Vitreous China Bowl

Countertops with vitreous china bowls shall include cutouts to template as furnished by the sink manufacturer. Manufacturer's standard sink mounting hardware for vitreous china rimless installation shall be provided. Seam between sink and counter top shall be sealed with silicone sealant. Sink, faucet, and plumbing requirements shall be in accordance with Section 15400 PLUMBING, GENERAL PURPOSE.

#### 2.3.6 ~~[AM003] Toilet Partition System~~

~~Floor-mounted, solid polymer toilet system shall be provided to dimensions and in locations as shown on the drawings. Panels and pilasters shall be fabricated from manufacturer's standard 13 mm thick sheet product. System shall include all necessary hardware for installation and mounting of panels, pilasters, and doors.~~

### PART 3 EXECUTION

#### 3.1 COORDINATION

In most instances, installation of solid polymer fabricated components and assemblies will require strong, correctly located structural support provided by other trades. To provide a stable, sound, secure installation, close coordination is required between the solid polymer fabricator/installer and other trades to insure that necessary structural

wall support, cabinet counter top structural support, proper clearances, and other supporting components are provided for the installation of wall panels, countertops, shelving, and all other solid polymer fabrications to the degree and extent recommended by the solid polymer manufacturer. Contractor shall appropriate staging areas for solid polymer fabrications.

### 3.2 INSTALLATION

#### 3.2.1 Components

All components and fabricated units shall be installed plumb, level, and rigid. Field joints between solid polymer components to provide a monolithic appearance shall be made using solid polymer manufacturer's approved seam adhesives, with joints inconspicuous in the finished work. Metal or vitreous china sinks and lavatory bowls shall be attached to counter tops using solid polymer manufacturer's recommended clear silicone sealant and mounting hardware. Solid polymer sinks and bowls shall be installed using a color-matched seam adhesive. Plumbing connections to sinks and lavatories shall be made in accordance with Section 15400 PLUMBING, GENERAL PURPOSE .

##### 3.2.1.1 Loose Counter Top Splashes

Loose splashes shall be mounted in locations as noted on the drawings. Loose splashes shall be adhered to the counter top with a color matched silicone sealant when the solid polymer components are solid colors. Adhesion of particulate patterned solid polymer splashes to counter tops shall utilize a clear silicone sealant.

#### 3.2.2 Silicone Sealant

A clear, silicone sealant or caulk shall be used to seal all expansion joints between solid polymer components and all joints between solid polymer components and other adjacent surfaces such as walls, floors, ceiling, and plumbing fixtures. Sealant bead shall be smooth and uniform in appearance and shall be the minimum size necessary to bridge any gaps between the solid surfacing material and the adjacent surface. Bead shall be continuous and run the entire length of the joint being sealed.

#### 3.2.3 Plumbing

Plumbing connections to sinks and lavatories shall be made in accordance with Section .

### 3.3 CLEAN-UP

Components shall be cleaned after installation and covered to protect against damage during completion of the remaining project items. Components damaged after installation by other trades will be repaired or replaced at the General Contractor's cost. Component supplier will provide a repair/replace cost estimate to the General Contractor who shall approve estimate before repairs are made.

-- End of Section --

## SECTION 08120

## ALUMINUM DOORS AND FRAMES

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

## ALUMINUM ASSOCIATION (AA)

AA 45 (1980) Aluminum Finishes

## AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 603.8 (1992; Addendum 1993) Pigmented Organic Coatings on Extruded Aluminum

AAMA 605.2 (1992; Addendum 1995) High Performance Organic Coatings on Architectural Extrusions and Panels

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36/A 36M (1997; Rev. A) Carbon Structural Steel

ASTM B 209M (1995) Aluminum and Aluminum-Alloy Sheet and Plate (Metric)

ASTM B 209 (1996) Aluminum and Aluminum-Alloy Sheet and Plate

ASTM B 221M (1996) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)

ASTM B 221 (1996) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

ASTM E 283 (1991) Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

ASTM E 331 (1996) Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference

## 1.2 PERFORMANCE REQUIREMENTS

## 1.2.1 Structural

Shapes and thicknesses of framing members shall be sufficient to withstand a design wind load of not less than {1.4} {      } kilopascals of supported

area} ~~{the design wind load indicated}~~ with a deflection of not more than 1/175 times the length of the member and a safety factor of not less than 1.65. Provide glazing beads, moldings, and trim of not less than 1.25 mm nominal thickness.

#### 1.2.2 Air Infiltration

When tested in accordance with ASTM E 283, air infiltration shall not exceed 2.63 by 10<sup>-5</sup> cms per square meter of fixed area at a test pressure of 0.30 kPa (80 kilometers per hour wind).

#### 1.2.3 Water Penetration

When tested in accordance with ASTM E 331, there shall be no water penetration at a pressure of 0.38 kPa of fixed area.

### 1.3 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

#### SD-02 Shop Drawings

Doors and frames; G

Show elevations of each door type, size of doors and frames, metal gages, details of door and frame construction, methods of anchorage, glazing details, weatherstripping, provisions for and location of hardware, and details of installation.

#### SD-08 Manufacturer's Instructions

Doors and frames

Submit detail specifications and instructions for installation, adjustments, cleaning, and maintenance.

### 1.4 DELIVERY, STORAGE, AND HANDLING

Inspect materials delivered to the site for damage. Unload and store with minimum handling. Provide storage space in dry location with adequate ventilation, free from dust or water, and easily accessible for inspection and handling. Stack materials on nonabsorptive strips or wood platforms. Do not cover doors and frames with tarps, polyethylene film, or similar coverings. Protect finished surfaces during shipping and handling using manufacturer's standard method, except that no coatings or lacquers shall be applied to surfaces to which calking and glazing compounds must adhere.

## PART 2 PRODUCTS

### 2.1 DOORS AND FRAMES

Swing-type aluminum doors and frames of size, design, and location indicated. Provide doors complete with frames, framing members {, subframes {, transoms {, adjoining sidelights {, adjoining window wall {, trim {, and accessories.

### 2.2 MATERIALS

### 2.2.1 Anchors

Stainless steel ~~for steel with hot-dipped galvanized finish~~.

### 2.2.2 Weatherstripping

Continuous wool pile, silicone treated, or type recommended by door manufacturer.

### 2.2.3 Aluminum Alloy for Doors and Frames

ASTM B 221M, Alloy 6063-T5 for extrusions. ASTM B 209M, alloy and temper best suited for aluminum sheets and strips.

### 2.2.4 Fasteners

Hard aluminum or stainless steel.

### 2.2.5 Structural Steel

ASTM A 36/A 36M.

### 2.2.6 Aluminum Paint

Type as recommended by aluminum door manufacturer.

## 2.3 FABRICATION

### 2.3.1 Aluminum Frames

Extruded aluminum shapes with contours approximately as indicated. Provide removable glass stops and glazing beads for frames accommodating fixed glass. Use countersunk stainless steel Phillips screws for exposed fastenings, and space not more than 300 mm o.c. Mill joints in frame members to a hairline fit, reinforce, and secure mechanically.

### 2.3.2 Aluminum Doors

Of type, size, and design indicated and not less than 45 mm thick. Minimum wall thickness, 3 mm, except beads and trim, 1.25 mm. Door sizes shown are nominal and shall include standard clearances as follows: 2.5 mm at hinge and lock stiles, 3 mm between meeting stiles, 3 mm at top rails, 5 mm between bottom and threshold, and 17 mm between bottom and floor. ~~{Bevel single-acting doors 2 or 3 mm at lock, hinge, and meeting stile edges.}~~ ~~{Double-acting doors shall have rounded edges at hinge stile, lock stile, and meeting stile edges.}~~

#### 2.3.2.1 Full Glazed Stile and Rail Doors

Doors shall have ~~{narrow}~~ ~~{medium}~~ ~~{wide}~~ stiles and rails as indicated. Fabricate from extruded aluminum hollow seamless tubes or from a combination of open-shaped members interlocked or welded together. Fasten top and bottom rail together by means of welding or by 10 or 13 mm diameter cadmium-plated tensioned steel tie rods. Provide an adjustable mechanism of jack screws or other methods in the top rail to allow for minor clearance adjustments after installation.

#### 2.3.2.2 ~~Flush Doors~~

~~Use facing sheets with [a vertical ribbed] [an embossed] [or] [a plain-smooth] surface. Use one of the following constructions:~~

- ~~a. A phenolic resin impregnated kraft paper honeycomb core, surrounded at edges and around glass and louvered areas with extruded aluminum shapes. The impregnation of core shall have a minimum of 18 percent resin content. Provide sheet aluminum door facings, not less than 0.8 mm thick laminated to a 2.5 mm thick tempered hardboard backing, and bond the backing to the honeycomb core. Bond facing sheets to core under heat and pressure with a thermosetting adhesive, and mechanically lock to the extruded edge members.~~
- ~~b. A phenolic resin impregnated kraft paper honeycomb core. Use aluminum facing sheets not less than 1.25 mm thick and form into two pans which will eliminate seams on the faces. Bond honeycomb core to the face sheets using an epoxy resin or contact cement type adhesive.~~
- ~~c. A solid fibrous core, surrounded at edges and around glass and louvered areas and cross braced at intermediate points with extruded aluminum shapes. Use aluminum facing sheets of not less than 1.25 mm thickness. Bond facing sheets to core under heat and pressure with a thermosetting adhesive, and mechanically lock to the extruded edge members.~~
- ~~d. Form from extruded tubular stiles and rails mitered at corners, reinforce, and continuously weld at miters. Facing sheets shall consist of 0.8 mm thick sheet aluminum internally reinforced with aluminum channels or Z bars placed horizontally not more than 400 mm apart and extending full width of panel. Fit spaces between reinforcing with sound deadening insulation. Facing sheets shall finish flush with faces of stiles and rails and be welded to reinforcing bars or channels and to stiles and rails.~~
- ~~e. Form from an internal grid system composed of extruded aluminum tubular sections. Provide extruded aluminum tubular sections at both sides, and at perimeters of louver and glass cutouts. Provide three extruded aluminum tubular sections at top and bottom of door. Wall thickness of tubular sections shall be not less than 2.25 mm except that lock rail shall be not less than 3 mm thick, hinge lock rail shall be not less than 3 mm thick, and hinge rail edge shall be not less than 5 mm thick. Fill spaces in door with mineral insulation. Facing sheets shall be of aluminum not less than 2.25 mm thick.~~
- ~~f. Form from extruded aluminum members at top and bottom, both sides, and at perimeters of louver and glass cutouts. Wall sections of extruded aluminum members shall be not less than 2.25 mm thick and be properly reinforced for application of hardware. Framing members shall be covered on both sides with aluminum facing sheets not less than 2 mm thick. Fill door with foamed in urethane with a 48 kg per cubic meter density.~~

### 2.3.3 Welding and Fastening

Where possible, locate welds on unexposed surfaces. Dress welds on exposed surfaces smoothly. Select welding rods, filler wire, and flux to produce a uniform texture and color in finished work. Remove flux and spatter from surfaces immediately after welding. Exposed screws or bolts will be



permitted only in inconspicuous locations, and shall have countersunk heads. Weld concealed reinforcements for hardware in place.

#### 2.3.4 Weatherstripping

Provide on stiles and rails of exterior doors. Fit into slots which are integral with doors or frames. Weatherstripping shall be replaceable without special tools, and adjustable at meeting rails of pairs of doors. Installation shall allow doors to swing freely and close positively. Air leakage of a single leaf weatherstripped door shall not exceed ~~{2.19 x 10<sup>-5</sup>}~~ ~~{5.48 x 10<sup>-5</sup>}~~ cubic meter per second of air per square meter of door area when tested in accordance with ASTM E 283.

#### 2.3.5 Anchors

On the backs of subframes, provide anchors of the sizes and shapes indicated for securing subframes to adjacent construction. Anchor transom bars at ends and mullions at head and sill. ~~{Where indicated, reinforce vertical mullions with structural steel members of sufficient length to extend up to the overhead structural slab or framing and secure thereto.}~~ Reinforce and anchor freestanding door frames to floor construction as indicated on approved shop drawings and in accordance with manufacturer's recommendation. Place anchors ~~{as indicated}~~ ~~{near top and bottom of each jamb and at intermediate points not more than 635 mm apart}~~.

#### 2.3.6 Provisions for Hardware

Hardware is specified in Section 08710, "Door Hardware." Deliver hardware templates and hardware (except field-applied hardware) to the door manufacturer for use in fabrication of aluminum doors and frames. Cut, reinforce, drill, and tap doors and frames at the factory to receive template hardware. Provide doors to receive surface-applied hardware, except push plates, kick plates, and mop plates, with reinforcing only; drill and tap in the field. Provide hardware reinforcements of stainless steel or steel with hot-dipped galvanized finish, and secure with stainless steel screws. ~~{Provide reinforcement in core of flush doors as required to receive locks, door closers, and other hardware.}~~

#### 2.3.7 Provisions for Glazing

Provide extruded aluminum snap-in glazing beads on interior side of doors. Provide extruded aluminum, theft-proof, snap-in glazing beads or fixed glazing beads on exterior or security side of doors. Glazing beads shall have vinyl insert glazing gaskets. Design glazing beads to receive glass of thickness indicated or specified. Glazing is specified in Section 08800N, "Glazing."

#### 2.3.8 Finishes

Provide exposed aluminum surfaces with factory finish of anodic coating ~~{mill finish}~~ ~~{factory finish of anodic coating or organic coating}~~.

##### 2.3.8.1 Anodic Coating

Clean exposed aluminum surfaces and provide an anodized finish conforming to AA 45. Finish shall be ~~{clear (natural), designation AA M10 C22 A31, Architectural Class II 0.01 to 0.0175 mm}~~ ~~{clear (natural), designation AA M10 C22 A41, Architectural Class I 0.0175 mm or thicker}~~ ~~{integral color anodized, designation AA M10 C22 A32, Architectural Class II 0.01 to~~

~~0.0175] [integral color anodized, designation AA M10-C22-A42, Architectural Class I 0.0175 mm or thicker] [electrolytically deposited color anodized, designation AA M10-C22-A34, Architectural Class II 0.01 to 0.0175 mm] [electrolytically deposited color-anodized, designation AA-M10-C22-A44, Architectural Class I 0.0175 mm or thicker]. {Color shall be dark bronze [\_\_\_\_\_] [as indicated].}~~

#### ~~2.3.8.2 Organic Coating~~

~~Clean and prime exposed aluminum surfaces. Provide [a baked enamel finish in accordance with AAMA 603.8 with total dry film thickness not less than 0.02 mm] [a high-performance finish in accordance with AAMA 605.2 with total dry film thickness of not less than 0.03 mm]. The finish color shall be [\_\_\_\_\_] [as indicated].~~

### PART 3 EXECUTION

#### 3.1 INSTALLATION

Plumb, square, level, and align frames and framing members to receive doors {, transoms} {, adjoining sidelights} {, and} {, adjoining window walls}. Anchor frames to adjacent construction as indicated and in accordance with manufacturer's printed instructions. Anchor bottom of each frame to rough floor construction with 2.4 mm thick stainless steel angle clips secured to back of each jamb and to floor construction; use stainless steel bolts and expansion rivets for fastening clip anchors. Seal metal-to-metal joints between framing members as specified in Section 07920N, "Joint Sealants." Hang doors to produce clearances specified in paragraph entitled "Aluminum Doors," of this section. After erection and glazing, adjust doors and hardware to operate properly.

#### 3.2 PROTECTION FROM DISSIMILAR MATERIALS

##### 3.2.1 Dissimilar Metals

Where aluminum surfaces come in contact with metals other than stainless steel, zinc, or small areas of white bronze, protect from direct contact by one or a combination of the following methods:

- a. Paint the dissimilar metal with one coat of heavy-bodied bituminous paint.
- b. Apply a good quality elastomeric sealant between the aluminum and the dissimilar metal.
- c. Paint the dissimilar metal with one coat of primer and one coat of aluminum paint.
- d. Use a nonabsorptive tape or gasket in permanently dry locations.

##### 3.2.2 Drainage from Dissimilar Metals

In locations where drainage from dissimilar metals has direct contact with aluminum, provide protective paint, to prevent aluminum discoloration.

##### 3.2.3 Masonry and Concrete

Provide aluminum surfaces in contact with mortar, concrete, or other masonry materials with one coat of heavy-bodied bituminous paint.

### 3.2.4 Wood or Other Absorptive Materials

Provide aluminum surfaces in contact with absorptive materials subject to frequent moisture, and aluminum surfaces in contact with treated wood, with two coats of aluminum paint or one coat of heavy-bodied bituminous paint. In lieu of painting the aluminum, the Contractor shall have the option of painting the wood or other absorptive surface with two coats of aluminum paint and sealing the joints with elastomeric sealant.

### 3.3 CLEANING

Upon completion of installation, clean door and frame surfaces in accordance with door manufacturer's recommended procedure. Do not use abrasive, caustic, or acid cleaning agents.

### 3.4 PROTECTION

Protect doors and frames from damage and from contamination by other materials such as cement mortar. Prior to completion and acceptance of the work, restore damaged doors and frames to original condition, or replace with new ones.

-- End of Section --

## SECTION 10800A

## TOILET ACCESSORIES

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 1036 (1991; R 1997) Flat Glass

## U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-2380 (Rev A)(Canc. Notice 1) Dispenser, Paper Towel

CID A-A-2398 (Rev BC); (Canc. Notice 1 Curtain, Shower and Window (Metric - SI)

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-03 Product Data

Finishes; G  
Accessory Items; G

Manufacturer's descriptive data and catalog cuts indicating materials of construction, fasteners proposed for use for each type of wall construction, mounting instructions, operation instructions, and cleaning instructions.

## SD-04 Samples

Finishes; G  
Accessory Items; G

One sample of each accessory proposed for use. Approved samples may be incorporated into the finished work, provided they are identified and their locations noted.

## 1.3 DELIVERY, STORAGE, AND HANDLING

Toilet accessories shall be wrapped for shipment and storage, delivered to the jobsite in manufacturer's original packaging, and stored in a clean,

dry area protected from construction damage and vandalism.

#### 1.4 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period shall be provided.

### PART 2 PRODUCTS

#### 2.1 MANUFACTURED UNITS

Toilet accessories shall be provided where indicated in accordance with paragraph SCHEDULE. Porcelain type, tile-wall accessories are specified in Section 09310 CERAMIC TILE. Each accessory item shall be complete with the necessary mounting plates and shall be of sturdy construction with corrosion resistant surface.

##### 2.1.1 Anchors and Fasteners

Anchors and fasteners shall be capable of developing a restraining force commensurate with the strength of the accessory to be mounted and shall be suited for use with the supporting construction. Exposed fasteners shall be of tamperproof design and shall be finished to match the accessory.

##### 2.1.2 Finishes

Except where noted otherwise, finishes on metal shall be provided as follows:

Metal	Finish
Stainless steel	No. 4 satin finish
Carbon steel, copper alloy, and brass	Chromium plated, bright

#### 2.2 ACCESSORY ITEMS

Accessory items shall conform to the requirements specified below.

##### 2.2.1 Grab Bar (GB)

Grab bar shall be 18 gauge, 32 mm OD Type 304 stainless steel. Grab bar shall be form and length as indicated. Concealed mounting flange shall have mounting holes concealed. Grab bar shall have peened non-slip surface. Installed bars shall be capable of withstanding a 2.225 kN vertical load without coming loose from the fastenings and without obvious permanent deformation. Space between wall and grab bar shall be 38 mm.

##### 2.2.2 Medicine Cabinet (MC)

Medicine cabinet shall be constructed with cold-rolled carbon steel sheet of not less than 0.76 mm thick, formed from a single sheet of steel or shall have mechanically formed spot welded or any other suitable joints. Width, height and depth of cabinet shall be in accordance with paragraph SCHEDULE.

##### 2.2.2.1 Swinging Door Cabinet, Class 2

Swinging door cabinet assembly including the lighting arrangement shall be as indicated. Assembly shall be recess mounted. Cabinet shall be located centrally behind the door and shall contain a minimum of two shelves. Door hinges shall be stainless steel or carbon steel. Magnets used in door catches shall be permanent type. Doors shall be with a mirror.

#### 2.2.3 Mirrors, Glass (MG)

Glass for mirrors shall be Type I transparent flat type, Class 1-clear. Glazing Quality q1 6 mm thick conforming to ASTM C 1036. Glass shall be coated on one surface with silver coating, copper protective coating, and mirror backing paint. Silver coating shall be highly adhesive pure silver coating of a thickness which shall provide reflectivity of 83 percent or more of incident light when viewed through 6 mm thick glass, and shall be free of pinholes or other defects. Copper protective coating shall be pure bright reflective copper, homogeneous without sludge, pinholes or other defects, and shall be of proper thickness to prevent "adhesion pull" by mirror backing paint. Mirror backing paint shall consist of two coats of special scratch and abrasion-resistant paint and shall be baked in uniform thickness to provide a protection for silver and copper coatings which will permit normal cutting and edge fabrication.

#### 2.2.4 Combination Paper Towel Dispenser/Waste Receptacle Units (PTDWR)

Dispenser/receptacle shall be semi-recessed and shall have a mechanism for dispensing standard roll towels. Waste receptacle shall be designed to be locked in unit and removable for service. Locking mechanism shall be tumbler key lock. Waste receptacle shall have a capacity of 68 L.[AM0003] (18 gal.) Unit shall be fabricated of not less than 0.8 mm stainless steel welded construction with all exposed surfaces having a satin finish. Waste receptacle that accepts reusable liner standard for unit manufacturer shall be provided.

#### 2.2.5 Shower Curtain (SC)

Shower curtain shall conform to CID A-A-2398, Style I, size to suit conditions. Curtain shall be anti-bacterial nylon/vinyl fabric. Color shall be white.

#### 2.2.6 ~~Shower Curtain Rods (SCR)~~[AM0003] Towel Shelf with Towel Bar

[AM0003] Shelf 160 mm (6-1/4") wide, consists of four 8 mm (5/16") round tubes mounted in support arms. 6 mm (1/4") round towel bar below shelf. Bright polished stainless steel. 610 mm (24") lengths. Overall height is 110 mm (4-1/4"). Projects 210 mm (8-1/4") from wall. Complying example: Brobrick B-7676. Shower curtain rods shall be Type 304 stainless steel 32 mm OD by 1.24 mm minimum straight to meet installation conditions.

#### 2.2.7 Soap Dispenser (SD)

Soap dispenser shall be lavatory mounted, liquid type consisting of a polyethylene tank with a minimum 0.94 L holding capacity and a 100 mm spout length.

#### 2.2.8 Soap Holder (SH)

Soap holder shall be surface mounted Type 304 stainless steel. Separate supports shall be stainless steel.

#### 2.2.9 Towel Bar (TB)

Towel bar shall be stainless steel with a minimum thickness of 0.38 mm. Bar shall be minimum 19 mm diameter, or 16 mm square. Finish shall be bright polish .

#### 2.2.10 Robe Hook (RH)

Robe Hook shall have concealed wall fastenings, and a pin or hook integral with or permanently fastened to wall flange. Maximum projection shall be 100 mm . Design shall be consistent with design of other accessory items. Finish shall be bright polish .

#### 2.2.11 Toilet Tissue Dispenser (TTD)

Toilet tissue holder shall be Type II - surface mounted with two rolls of standard tissue mounted horizontally . Cabinet shall be stainless steel, satin finish.

#### 2.2.12 Toothbrush and Tumbler Holder (TTH)

Toothbrush and tumbler holder shall be stainless steel, surface mounted. Holder shall hold a minimum of four toothbrushes in a vertical position. Size of hole for securing tumbler shall be 57 plus or minus 3 mm in diameter.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

Toilet accessories shall be securely fastened to the supporting construction in accordance with the manufacturer's approved instructions. Accessories shall be protected from damage from the time of installation until acceptance.

#### 3.2 CLEANING

Material shall be cleaned in accordance with manufacturer's recommendations. Alkaline or abrasive agents shall not be used. Precautions shall be taken to avoid scratching or marring of surfaces.

#### 3.3 SCHEDULE

Toilet accessories are scheduled on the drawings.

-- End of Section --

## SECTION 15181A

## CHILLED WATER PIPING AND ACCESSORIES

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z21.22	(1999) Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems
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## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 106	(1999e1) Seamless Carbon Steel Pipe for High-Temperature Service
ASTM A 182/A 182M	(2001) Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
ASTM A 183	(1998) Carbon Steel Track Bolts and Nuts
ASTM A 193/A 193M	(2001a) Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
ASTM A 47/A 47M	(1999) Ferritic Malleable Iron Castings
ASTM A 53/A 53M	(2001) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 536	(1984; R 1999e1) Ductile Iron Castings
ASTM A 653/A 653M	(2000) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A 733	(1999) Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples
ASTM B 117	(1997) Operating Salt Spray (Fog) Apparatus
ASTM B 32	(1996) Solder Metal
ASTM B 62	(1993) Composition Bronze or Ounce Metal Castings
ASTM B 75	(1999) Seamless Copper Tube
ASTM B 75M	(1999) Seamless Copper Tube (Metric)



ASTM B 813	(2000) Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube
ASTM B 88	(1999) Seamless Copper Water Tube
ASTM B 88M	(1999) Seamless Copper Water Tube (Metric)
ASTM D 1384	(1997a) Corrosion Test for Engine Coolants in Glassware
ASTM D 2000	(1999) Rubber Products in Automotive Applications
ASTM D 3308	(1997) PTFE Resin Skived Tape
ASTM D 520	(2000) Zinc Dust Pigment
ASTM D 596	(1991; R 1995) Reporting Results of Analysis of Water
ASTM E 84	(2000a) Surface Burning Characteristics of Building Materials
ASTM F 1007	(1986; R 1996) Pipe-Line Expansion Joints of the Packed Slip Type for Marine Application
ASTM F 1120	(1987; R 1998) Circular Metallic Bellows Type Expansion Joints for Piping Applications
ASTM F 1199	(1988; R 1998) Cast (All Temperature and Pressures) and Welded Pipe Line Strainers (150 psig and 150 degrees F Maximum)

## AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1003	(1995) Water Pressure Reducing Valves for Domestic Water Supply Systems
ASSE 1017	(1986) Temperature Actuated Mixing Valves for Primary Domestic use

## AMERICAN WATER WORKS ASSOCIATION(AWWA)

AWWA C606	(1997) Grooved and Shouldered Joints
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## AMERICAN WELDING SOCIETY (AWS)

AWS A5.8	(1992) Filler Metals for Brazing and Braze Welding
AWS Brazing Hdbk	(1991) Brazing Handbook
AWS D1.1	(2000) Structural Welding Code - Steel
AWS Z49.1	(1999) Safety in Welding and Cutting

## ASME INTERNATIONAL (ASME)

ASME B1.20.1	(1983; R 1992) Pipe Threads, General Purpose (Inch)
ASME B16.11	(1996) Forged Fittings, Socket-Welding and Threaded
ASME B16.18	(1984; R 1994) Cast Copper Alloy Solder Joint Pressure Fittings
ASME B16.21	(1992) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.22	(1995; B16.22a1998) Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B16.26	(1988) Cast Copper Alloy Fittings for Flared Copper Tubes
ASME B16.3	(1998) Malleable Iron Threaded Fittings
ASME B16.39	(1998) Malleable Iron Threaded Pipe Unions Classes 150, 250, and 300
ASME B16.5	(1996; B16.5a) Pipe Flanges and Flanged Fittings NPS 1/2 thru NPS 24
ASME B16.9	(1993) Factory-Made Wrought Steel Buttwelding Fittings
ASME B31.1	(1998) Power Piping
ASME B31.9	(1996) Building Services Piping
ASME B40.1	(1991) Gauges - Pressure Indicating Dial Type - Elastic Element
ASME BPVC SEC IX	(1998) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications
ASME BPVC SEC VIII D1	(1998) Boiler and Pressure Vessel Code; Section VIII, Pressure Vessels Division 1 - Basic Coverage

## EXPANSION JOINT MANUFACTURERS ASSOCIATION (EJMA)

EJMA Stds	(1998; 7th Edition) EJMA Standards
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## HYDRAULIC INSTITUTE (HI)

HI 1.1-1.5	(1994) Centrifugal Pumps
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## MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-110	(1996) Ball Valves Threaded,
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Socket-Welding, Solder Joint, Grooved and Flared Ends

MSS SP-25 (1998) Standard Marking System for Valves, Fittings, Flanges and Unions

MSS SP-58 (1993) Pipe Hangers and Supports - Materials, Design and Manufacture

MSS SP-67 (1995) Butterfly Valves

MSS SP-69 (1996) Pipe Hangers and Supports - Selection and Application

MSS SP-70 (1998) Cast Iron Gate Valves, Flanged and Threaded Ends

MSS SP-71 (1997) Gray Iron Swing Check Valves, Flanges and Threaded Ends

MSS SP-72 (1999) Ball Valves with Flanged or Butt-Welding Ends for General Service

MSS SP-78 (1998) Cast Iron Plug Valves, Flanged and Threaded Ends

MSS SP-80 (1997) Bronze Gate, Globe, Angle and Check Valves

MSS SP-85 (1994) Cast Iron Globe & Angle Valves, Flanged and Threaded Ends

#### NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250 (1997) Enclosures for Electrical Equipment (1000 Volts Maximum)

NEMA MG 1 (1998) Motors and Generators

NEMA MG 2 (1989) Safety Standard for Construction and Guide for Selection, Installation, and Use of Electric Motors and Generators

#### NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 90A (1999) Installation of Air Conditioning and Ventilating Systems

#### U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-50541 (Basic) Valves, Tank Float, Angle and Globe Pattern (Inch-Pound)

### 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be

submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-02 Shop Drawings

##### Piping System

Drawings, at least 5 weeks prior to beginning construction, provided in adequate detail to demonstrate compliance with contract requirements. Drawings shall consist of:

- a. Piping layouts which identify all valves and fittings.
- b. Plans and elevations which identify clearances required for maintenance and operation.

#### SD-03 Product Data

##### Piping System

Manufacturer's standard catalog data, at least 5 weeks prior to the purchase or installation of a particular component, highlighted to show material, size, options, performance charts and curves, etc. in adequate detail to demonstrate compliance with contract requirements. Data shall include manufacturer's recommended installation instructions and procedures. Data shall be provided for the following components as a minimum:

- a. Piping and Fittings
- b. Valves and Accessories
- c. Expansion Joints
- d. Pumps
- e. Expansion Tanks
- f. Air Separator Tanks
- g. Pipe Hangers, Inserts, and Supports

##### Water Treatment Systems

Six complete copies, at least 5 weeks prior to the purchase of the water treatment system, of the proposed water treatment plan including a layout, control scheme, a list of existing make-up water conditions including the items listed in paragraph "Water Analysis", a list of chemicals, the proportion of chemicals to be added, the final treated water conditions, and a description of environmental concerns for handling the chemicals.

##### Spare Parts

Spare parts data for each different item of equipment specified, after approval of detail drawings and not later than 2 months prior to the date of beneficial occupancy. The data shall include a complete list of parts and supplies, with current unit prices and source of supply, a recommended spare parts list for 1 year of operation, and a list of the parts recommended by the manufacturer

to be replaced on a routine basis.

#### Qualifications

Six copies of qualified procedures, and list of names and identification symbols of qualified welders and welding operators, prior to non-factory welding operations.

#### Field Tests

A schedule, at least 2 weeks prior to the start of related testing, for each test. The schedules shall identify the proposed date, time, and location for each test.

#### Demonstrations

A schedule, at least 2 weeks prior to the date of the proposed training course, which identifies the date, time, and location for the training.

#### Verification of Dimensions

A letter, at least 2 weeks prior to beginning construction, including the date the site was visited, conformation of existing conditions, and any discrepancies found.

### SD-06 Test Reports

#### Field Tests

Six copies of the report shall be provided in bound 216 x 279 mm (8 1/2 x 11 inch) booklets. Reports shall document all phases of the tests performed. The report shall include initial test summaries, all repairs/adjustments made, and the final test results.

#### One-Year Inspection

Six copies of an inspection report, at the completion of one year of service, in bound 216 x 279 (8 1/2 x 11 inch) inch booklets. The report shall identify the condition of each cooling tower and condenser. The report shall also include a comparison of the condition of the cooling tower and condenser with the manufacturer's recommended operating conditions. The report shall identify all actions taken by the Contractor and manufacturer to correct deficiencies during the first year of service.

### SD-07 Certificates

#### Service Organization

A certified list of qualified permanent service organizations, which includes their addresses and qualifications, for support of the equipment. The service organizations shall be reasonably convenient to the equipment installation and be able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

### SD-10 Operation and Maintenance Data

#### Operation Manuals

Six complete copies of an operation manual in bound 216 x 279 (8 1/2 x 11 inch) booklets listing step-by-step procedures required for system startup, operation, abnormal shutdown, emergency shutdown, and normal shutdown at least 4 weeks prior to the first training course. The booklets shall include the manufacturer's name, model number, and parts list. The manuals shall include the manufacturer's name, model number, service manual, and a brief description of all equipment and their basic operating features.

#### Maintenance Manuals

Six complete copies of maintenance manual in bound 216 x 279 (8 1/2 x 11 inch) booklets listing routine maintenance procedures, possible breakdowns and repairs, and a trouble shooting guide. The manuals shall include piping layouts and simplified wiring and control diagrams of the system as installed.

#### Water Treatment Systems

Six complete copies of operating and maintenance manuals for the step-by-step water treatment procedures. The manuals shall include testing procedures used in determining water quality.

### 1.3 QUALIFICATIONS

Piping shall be welded in accordance with the qualified procedures using performance qualified welders and welding operators. Procedures and welders shall be qualified in accordance with ASME BPVC SEC IX. Welding procedures qualified by others, and welders and welding operators qualified by another employer may be accepted as permitted by ASME B31.1. The Contracting Officer shall be notified 24 hours in advance of tests and the tests shall be performed at the work site if practical. The welder or welding operator shall apply the personally assigned symbol near each weld made, as a permanent record. Structural members shall be welded in accordance with Section 05090A WELDING, STRUCTURAL.

### 1.4 SAFETY REQUIREMENTS

Exposed moving parts, parts that produce high operating temperature, parts which may be electrically energized, and parts that may be a hazard to operating personnel shall be insulated, fully enclosed, guarded, or fitted with other types of safety devices. Safety devices shall be installed so that proper operation of equipment is not impaired. Welding and cutting safety requirements shall be in accordance with AWS Z49.1.

### 1.5 DELIVERY, STORAGE, AND HANDLING

Stored items shall be protected from the weather, humidity and temperature variations, dirt and dust, or other contaminants. Proper protection and care of all material both before and during installation shall be the Contractor's responsibility. Any materials found to be damaged shall be replaced at the Contractor's expense. During installation, piping and similar openings shall be capped to keep out dirt and other foreign matter.

### 1.6 PROJECT/SITE CONDITIONS

#### 1.6.1 Verification of Dimensions

The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

### 1.6.2 Drawings

Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. The Contractor shall carefully investigate the plumbing, fire protection, electrical, structural and finish conditions that would affect the work to be performed and shall arrange such work accordingly, furnishing required offsets, fittings, and accessories to meet such conditions.

## PART 2 PRODUCTS

### 2.1 STANDARD COMMERCIAL PRODUCTS

Materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacturing of such products, which are of a similar material, design and workmanship. The standard products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2 year use shall include applications of equipment and materials under similar circumstances and of similar size. The 2 years experience shall be satisfactorily completed by a product which has been sold or is offered for sale on the commercial market through advertisements, manufacturer's catalogs, or brochures. Products having less than a 2 year field service record shall be acceptable if a certified record of satisfactory field operation, for not less than 6000 hours exclusive of the manufacturer's factory tests, can be shown. Products shall be supported by a service organization. System components shall be environmentally suitable for the indicated locations.

### 2.2 NAMEPLATES

Major equipment including pumps, pump motors, expansion tanks, and air separator tanks shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the item of equipment. Plates shall be durable and legible throughout equipment life and made of stainless steel. Plates shall be fixed in prominent locations with nonferrous screws or bolts.

### 2.3 ELECTRICAL WORK

Electrical equipment, motors, motor efficiencies, and wiring shall be in accordance with Section 16415A ELECTRICAL WORK, INTERIOR. Electrical motor driven equipment specified shall be provided complete with motors, motor starters, and controls. Electrical characteristics shall be as shown, and unless otherwise indicated, all motors of 746 kW (1 hp) and above with open, dripproof, totally enclosed, or explosion proof fan cooled enclosures, shall be high efficiency type. Field wiring shall be in accordance with manufacturer's instructions. Each motor shall conform to NEMA MG 1 and NEMA MG 2 and be of sufficient size to drive the equipment at the specified capacity without exceeding the nameplate rating of the motor.

Motors shall be continuous duty with the enclosure specified. Motor starters shall be provided complete with thermal overload protection and other appurtenances necessary for the motor control indicated. Motors shall be furnished with a magnetic across-the-line or reduced voltage type starter as required by the manufacturer. Motor duty requirements shall allow for maximum frequency start-stop operation and minimum encountered interval between start and stop. Motors shall be sized for the applicable loads. Motor torque shall be capable of accelerating the connected load within 20 seconds with 80 percent of the rated voltage maintained at motor

terminals during one starting period. Motor bearings shall be fitted with grease supply fittings and grease relief to outside of enclosure. Manual or automatic control and protective or signal devices required for the operation specified and any control wiring required for controls and devices specified, but not shown, shall be provided.

## 2.4 PIPING SYSTEM

System design, component selection, and system installation, including pressure containing parts and material, shall be based upon a minimum service pressure of 862 kPa at 66 degrees C ; minimum ANSI Class 125. Chilled and condenser water piping shall be steel pipe with the exception that piping 100 mm and smaller may be copper tubing.

## 2.5 STEEL PIPE

Steel pipe shall conform to ASTM A 53/A 53M, Schedule 40, Type E or S, Grades A or B. Type F pipe shall not be used.

### 2.5.1 Fittings and End Connections (Joints)

Fittings and end connections shall be as defined herein, except as identified elsewhere. Piping and fittings 25 mm (1 inch) and smaller shall have threaded connections. Piping and fittings larger than 25 mm (1 inch) and smaller than 80 mm (3 inches) shall have either threaded, grooved, or welded connections. Piping and fittings 80 mm (3 inches) and larger shall have grooved, welded, or flanged connections. Rigid grooved mechanical connections may only be used in serviceable aboveground locations where the temperature of the circulating medium does not exceed 110 degrees C . Flexible grooved connections shall be used only as a flexible connector with grooved pipe system. Unless otherwise specified, grooved piping components shall meet the corresponding criteria specified for the similar welded, flanged, or threaded component specified herein. The manufacturer of each fitting shall be permanently identified on the body of the fitting in accordance with MSS SP-25.

#### 2.5.1.1 Threaded Connections

Threaded valves and pipe connections shall conform to ASME B1.20.1. Threaded fitting shall conform to ASME B16.3. Threaded unions shall conform to ASME B16.39. Threaded pipe nipples shall conform to ASTM A 733.

#### 2.5.1.2 Flanged Connections

Flanges shall conform to ASTM A 182/A 182M and ASME B16.5, Class 150. Gaskets shall be nonasbestos compressed material in accordance with ASME B16.21, 1.59 mm (1/16 inch) thickness, full face or self-centering flat ring type. These gaskets shall contain aramid fibers bonded with styrene butadiene rubber (SBR) or nitrile butadiene rubber (NBR). Bolts, nuts, and bolt patterns shall conform to ASME B16.5. Bolts shall be high or intermediate strength material conforming to ASTM A 193/A 193M.

#### 2.5.1.3 Welded Connections

Welded valves and pipe connections (both butt-welds and socket-welds types) shall conform to ASME B31.9. Butt-welded fittings shall conform to ASME B16.9. Socket-welded fittings shall conform to ASME B16.11. Welded fittings shall be identified with the appropriate grade and marking symbol.



#### 2.5.1.4 Grooved Mechanical Connections

Fitting and coupling houses shall be malleable iron conforming to ASTM A 47/A 47M, Grade 32510; ductile iron conforming to ASTM A 536, Grade 65-45-12; or steel conforming ASTM A 106, Grade B or ASTM A 53/A 53M. Gaskets shall be molded synthetic rubber with central cavity, pressure responsive configuration and shall conform to ASTM D 2000 Grade No. 2CA615A15B44F17Z for circulating medium up to 110 degrees C (230 degrees F) or Grade No. M3BA610A15B44Z for circulating medium up to 93 degrees C (200 degrees F) . Grooved mechanical connections shall conform to AWWA C606. Coupling nuts and bolts shall be steel and shall conform to ASTM A 183. Pipe connections and fittings shall be the product of the same manufacturer.

#### 2.5.1.5 Dielectric Waterways and Flanges

Dielectric waterways shall have a water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint. When dry, insulation barrier shall be able to withstand a 600-volt breakdown test. Dielectric waterways shall be constructed of galvanized steel and have threaded end connections to match connecting piping. Dielectric waterways shall be suitable for the required operating pressures and temperatures. Dielectric flanges shall provide the same pressure ratings as standard flanges and provide complete electrical isolation between connecting pipe and/or equipment as described herein for dielectric waterways.

### 2.6 COPPER PIPE

Copper pipe shall conform to ASTM B 88M , Type K or L.

#### 2.6.1 Fittings and End Connections (Joints)

Wrought copper and bronze solder-joint pressure fittings shall conform to ASME B16.22 and ASTM B 75M . Cast copper alloy solder-joint pressure fittings shall conform to ASME B16.18. Cast copper alloy fittings for flared copper tube shall conform to ASME B16.26 and ASTM B 62. Brass or bronze adapters for brazed tubing may be used for connecting tubing to flanges and to threaded ends of valves and equipment. Extracted brazed tee joints produced with an acceptable tool and installed as recommended by the manufacturer may be used.

##### 2.6.1.1 Grooved Mechanical Connections

Grooved mechanical joints and fittings shall be designed for not less than 862 kPa service and shall be the product of the same manufacturer. Grooved fitting and mechanical coupling housing shall be ductile iron conforming to ASTM A 536. Gaskets for use in grooved joints shall be molded synthetic polymer of pressure responsive design and shall conform to ASTM D 2000 for circulating medium up to 110 degrees C . Grooved joints shall conform to AWWA C606. Coupling nuts and bolts for use in grooved joints shall be steel and shall conform to ASTM A 183. Pipe connections and fittings shall be the product of the same manufacturer.

##### 2.6.2 Solder

Solder shall conform to ASTM B 32, grade Sb5, tin-antimony alloy for service pressures up to 1034 kPa . Solder flux shall be liquid or paste form, non-corrosive and conform to ASTM B 813.

### 2.6.3 Brazing Filler Metal

Filler metal shall conform to AWS A5.8, Type BAg-5 with AWS Type 3 flux, except Type BCuP-5 or BCuP-6 may be used for brazing copper-to-copper joints.

## 2.7 VALVES

Valves shall meet the material, fabrication and operating requirements of ASME B31.1. Chain operators shall be provided for valves located 3 m or higher above the floor. Valves in sizes larger than 25 mm (1 inch) and used on steel pipe systems, may be provided with rigid grooved mechanical joint ends. Such grooved end valves shall be subject to the same requirements as rigid grooved mechanical joints and fittings and, shall be provided by the same manufacturer as the grooved pipe joint and fitting system.

### 2.7.1 Gate Valve

Gate valves 65 mm (2-1/2 inches) and smaller shall conform to MSS SP-80 and shall be bronze with rising stem and threaded, soldered, or flanged ends. Gate valves 80 mm (3 inches) and larger shall conform to MSS SP-70, Type I, II, Class 125, Design OF and shall be cast iron with bronze trim, outside screw and yoke, and flanged or threaded ends.

### 2.7.2 Globe and Angle Valve

Globe and angle valves 65 mm (2-1/2 inches) and smaller shall conform to MSS SP-80 and shall be bronze with threaded, soldered, or flanged ends. Globe and angle valves 80 mm (3 inches) and larger shall conform to MSS SP-85 and shall be cast iron with bronze trim and flanged or threaded ends.

### 2.7.3 Check Valve

Check valves 65 mm (2-1/2 inches) and smaller shall conform to MSS SP-80 and shall be bronze with threaded, soldered, or flanged ends. Check valves 80 mm (3 inches) and larger shall conform to MSS SP-71, Type I, II, III, or IV, Class 125 or 150 and shall be cast iron with bronze trim and flanged or threaded ends.

### 2.7.4 Butterfly Valve

Butterfly valves shall be in accordance with MSS SP-67, Type 1 and shall be either the wafer or lug type. Valves shall be bubble tight at 1,000 kPa. Valve bodies shall be cast iron, malleable iron, or steel. Valves smaller than 200 mm (8 inches) shall have throttling handles with a minimum of seven locking positions. Valves 200 mm (8 inches) and larger shall have totally enclosed manual gear operators with adjustable balance return stops and position indicators. Valves in insulated lines shall have extended neck to accommodate insulation thickness.

### 2.7.5 Plug Valve

Plug valves 50 mm (2 inches) and larger shall conform to MSS SP-78, have flanged or threaded ends, and have cast iron bodies with bronze trim. Valves 50 mm (2 inches) and smaller shall be bronze with NPT connections for black steel pipe and brazed connections for copper tubing. Valve shall be lubricated, non-lubricated, or tetrafluoroethylene resin-coated type. Valve shall be resilient, double seated, trunnion mounted with tapered lift

plug capable of 2-way shutoff. Valve shall operate from fully open to fully closed by rotation of the handwheel to lift and turn the plug. Valve shall have weatherproof operators with mechanical position indicators. Valves 200 mm (8 inches) or larger shall be provided with manual gear operators with position indicators.

#### 2.7.6 Ball Valve

Ball valves 15 mm (1/2 inch) and larger shall conform to MSS SP-72 or MSS SP-110 and shall be ductile iron or bronze with threaded, soldered, or flanged ends. Valves 200 mm (8 inches) or larger shall be provided with manual gear operators with position indicators.

#### 2.7.7 Drain Valves

Valves shall be the gate valve type which are in accordance with MSS SP-80. Valve shall be manually-operated, 20 mm pipe size and above with a threaded end connection. Valve shall be provided with a water hose nipple adapter.

#### 2.7.8 Air Vents

Manually-operated general service type air vents shall be brass or bronze valves which are furnished with threaded plugs or caps. Air vents on water coils shall have not less than 3 mm threaded end connections. Air vents on water mains shall have not less than 20 mm threaded end connections. Air vents on all other applications shall have not less than 15 mm threaded end connections.

### 2.8 PIPING ACCESSORIES

#### 2.8.1 Strainer

Strainer shall be in accordance with ASTM F 1199, except as modified herein. Strainer shall be the cleanable, basket or "Y" type, the same size as the pipeline. Strainer bodies shall be fabricated of cast iron with bottoms drilled, and tapped. The bodies shall have arrows clearly cast on the sides indicating the direction of flow. Strainer shall be equipped with removable cover and sediment screen. The screen shall be made of minimum 0.8 mm (22 gauge) monel, with small perforations numbering not less than 60 per square centimeter (400 per square inch) to provide a net free area through the basket of at least 3.30 times that of the entering pipe. The flow shall be into the screen and out through the perforations.

#### 2.8.2 Combination Strainer and Suction Diffuser

Unit shall consist of an angle type body with removable strainer basket and straightening vanes, a suction pipe support, and a blowdown outlet. Strainer shall be in accordance with ASTM F 1199, except as modified herein. Unit body shall have arrows clearly cast on the sides indicating the direction of flow. Strainer screen shall be made of minimum 0.8 mm (22 gauge) monel, with small perforations numbering not less than 60 per square centimeter (400 per square inch) to provide a net free area through the basket of at least 3.30 times that of the entering pipe. Flow shall be into the screen and out through the perforations.

#### 2.8.3 Flexible Pipe Connectors

Flexible pipe connectors shall be designed for 862 kPa (125 psig) or 1034

kPa (150 psig) service as appropriate for the static head plus the system head, and 110 degrees C, for grooved end flexible connectors. The flexible section shall be constructed of rubber, tetrafluoroethylene resin, or corrosion-resisting steel, bronze, monel, or galvanized steel. The flexible section shall be suitable for intended service with end connections to match adjacent piping. Flanged assemblies shall be equipped with limit bolts to restrict maximum travel to the manufacturer's standard limits. Unless otherwise indicated, the length of the flexible connectors shall be as recommended by the manufacturer for the service intended. Internal sleeves or liners, compatible with circulating medium, shall be provided when recommended by the manufacturer. Covers to protect the bellows shall be provided where indicated.

#### 2.8.4 Pressure and Vacuum Gauges

Gauges shall conform to ASME B40.1 and shall be provided with throttling type needle valve or a pulsation dampener and shut-off valve. Gauge shall be a minimum of 85 mm in diameter with a range from 0 kPa (0 psig) to approximately 1.5 times the maximum system working pressure. Each gauge range shall be selected so that at normal operating pressure, the needle is within the middle-third of the range.

#### 2.8.5 Temperature Gauges

Temperature gauges shall be the industrial duty type and be provided for the required temperature range. Gauges shall have Celsius scale in 1 degree graduations scale (black numbers) on a white face. The pointer shall be adjustable. Rigid stem type temperature gauges shall be provided in thermal wells located within 1.5 m of the finished floor. Universal adjustable angle type or remote element type temperature gauges shall be provided in thermal wells located 1.5 to 2.1 m above the finished floor. Remote element type temperature gauges shall be provided in thermal wells located 2.1 m above the finished floor.

##### 2.8.5.1 Stem Cased-Glass

Stem cased-glass case shall be polished stainless steel or cast aluminum, 229 mm (9 inches) long, with clear acrylic lens, and non-mercury filled glass tube with indicating-fluid column.

##### 2.8.5.2 Bimetallic Dial

Bimetallic dial type case shall be not less than 89 mm (3-1/2 inches), stainless steel, and shall be hermetically sealed with clear acrylic lens. Bimetallic element shall be silicone dampened and unit fitted with external calibrator adjustment. Accuracy shall be one percent of dial range.

##### 2.8.5.3 Liquid-, Solid-, and Vapor-Filled Dial

Liquid-, solid-, and vapor-filled dial type cases shall be not less than 89 mm (3-1/2 inches), stainless steel or cast aluminum with clear acrylic lens. Fill shall be nonmercury, suitable for encountered cross-ambients, and connecting capillary tubing shall be double-braided bronze.

##### 2.8.5.4 Thermal Well

Thermal well shall be identical size, 15 or 20 mm (1/2 or 3/4 inch) NPT connection, brass or stainless steel. Where test wells are indicated, provide captive plug-fitted type 15 mm (1/2 inch) NPT connection suitable

for use with either engraved stem or standard separable socket thermometer or thermostat. Mercury shall not be used in thermometers. Extended neck thermal wells shall be of sufficient length to clear insulation thickness by 25 mm .

#### 2.8.6 Pipe Hangers, Inserts, and Supports

Pipe hangers, inserts, guides, and supports shall conform to MSS SP-58 and MSS SP-69.

#### 2.8.7 Escutcheons

Escutcheons shall be chromium-plated iron or chromium-plated brass, either one piece or split pattern, held in place by internal spring tension or set screws.

### 2.9 PUMPS

Pumps shall be the electrically driven, non-overloading, centrifugal type which conform to HI 1.1-1.5. Pump capacity, efficiency, motor size, and impeller type shall be as indicated on the drawings. Pumps shall be selected at or within 5 percent of peak efficiency. Pump curve shall rise continuously from maximum capacity to shutoff. Pump motor shall conform to NEMA MG 1, be open , and have sufficient wattage (horsepower) for the service required. Pump motor shall be equipped with an across-the-line magnetic controller in a NEMA 250, Type 1 enclosure with "START-STOP" switch in the cover.

#### 2.9.1 Construction

Shaft seal shall be mechanical-seal or stuffing-box type. Impeller shall be statically and dynamically balanced. Each pump casing shall be designed to withstand the discharge head specified plus the static head on system plus 50 percent of the total, but not less than 862 kPa (125 psig) . Pump casing and bearing housing shall be close grained cast iron. High points in the casing shall be provided with manual air vents; low points shall be provided with drain plugs. Impeller, impeller wearing rings, glands, casing wear rings, and shaft sleeve shall be bronze. Shaft shall be carbon or alloy steel, turned and ground. Bearings shall be ball-bearings, roller-bearings, or oil-lubricated bronze-sleeve type bearings, and be efficiently sealed or isolated to prevent loss of oil or entrance of dirt or water. Pump and motor shall be mounted on a common cast iron base having lipped edges and tapped drainage openings or structural steel base with lipped edges and drain pan and tapped drainage openings. Pump shall be provided with shaft coupling guard. Pump motor shall have the required capacity to prevent overloading with pump operating at any point on its characteristic curve. Pump speed shall not exceed 3,600 rpm, except where the pump head is less than 180 kPa , the pump speed shall not exceed 1,750 rpm. Pump shall be accessible for servicing without disturbing piping connections.

#### 2.9.2 Mechanical Shaft Seals

Seals shall be single, inside mounted, end-face-elastomer bellows type with stainless steel spring, brass or stainless steel seal head, carbon rotating face, and tungsten carbide or ceramic sealing face. Glands shall be bronze and of the water-flush design to provide lubrication flush across the face of the seal. Bypass line from pump discharge to flush connection in gland shall be provided, with filter or cyclone separator in line.

## 2.10 EXPANSION TANKS

Tank shall be welded steel, constructed, tested and stamped in accordance with ASME BPVC SEC VIII D1 for a working pressure of 862 kPa and precharged to the minimum operating pressure. Tank shall have a replaceable diaphragm and be the captive air type. Tanks shall accommodate expanded water of the system generated within the normal operating temperature range, limiting this pressure increase at all components in the system to the maximum allowable pressure at those components. Each tank air chamber shall be fitted with a drain, fill, an air charging valve, and system connections. Tank shall be supported by steel legs or bases for vertical installation or steel saddles for horizontal installations. The only air in the system shall be the permanent sealed-in air cushion contained within the expansion tank.

## 2.11 AIR SEPARATOR TANKS

External air separation tank shall have an internal design suitable for creating the required vortex and subsequent air separation. Tank shall be steel, constructed, tested, and stamped in accordance with ASME BPVC SEC VIII D1 for a working pressure of 862 kPa. Tank shall have tangential inlets and outlets connections, threaded for 50 mm and smaller and flanged for sizes 65 mm and larger. Air released from a tank shall be vented as indicated. Tank shall be provided with a blow-down connection.

## 2.12 WATER TREATMENT SYSTEMS

When water treatment is specified, the use of chemical-treatment products containing hexavalent chromium (Cr) is prohibited.

## 2.12.1 Water Analysis

Conditions of make-up water to be supplied to the condenser and chilled water systems are to be reported in accordance with ASTM D 596 as follows:

Date of Sample	_____
Temperature	_____ degrees C.
Silica (SiO <sub>2</sub> )	_____ ppm (mg/l)
Insoluble	_____ ppm (mg/l)
Iron and Aluminum Oxides	_____ ppm (mg/l)
Calcium (Ca)	_____ ppm (mg/l)
Magnesium (Mg)	_____ ppm (mg/l)
Sodium and Potassium (Na and K)	_____ ppm (mg/l)
Carbonate (HCO <sub>3</sub> )	_____ ppm (mg/l)
Sulfate (SO <sub>4</sub> )	_____ ppm (mg/l)
Chloride (Cl)	_____ ppm (mg/l)
Nitrate (NO <sub>3</sub> )	_____ ppm (mg/l)
Turbidity	_____ unit
pH	_____
Residual Chlorine	_____ ppm (mg/l)
Total Alkalinity	_____ epm (meq/l)
Non-Carbonate Hardness	_____ epm (meq/l)
Total Hardness	_____ epm (meq/l)
Dissolved Solids	_____ ppm (mg/l)
Fluorine	_____ ppm (mg/l)
Conductivity	_____ micrmho/cm

## 2.12.2 Chilled Water

Water to be used in the chilled water systems shall be treated to maintain the conditions recommended by this specification as well as the recommendations from the manufacturers. Chemicals shall meet all required federal, state, and local environmental regulations for the treatment of evaporator coils and direct discharge to the sanitary sewer.

#### 2.12.3 Water Treatment Services

The services of a company regularly engaged in the treatment of chilled water systems shall be used to determine the correct chemicals required, the concentrations required, and the water treatment equipment sizes and flow rates required. The company shall maintain the chemical treatment and provide all chemicals required for the chilled water systems for a period of 1 year from the date of occupancy. The chemical treatment and services provided over the 1 year period shall meet the requirements of this specification as well as the recommendations from the manufacturers of the condenser and evaporator coils. Acid treatment and proprietary chemicals shall not be used.

#### 2.12.4 Chilled Water System

A shot feeder shall be provided on the chilled water piping as indicated. Size and capacity of feeder shall be based on local requirements and water analysis. The feeder shall be furnished with an air vent, gauge glass, funnel, valves, fittings, and piping.

### 2.13 FABRICATION

#### 2.13.1 Factory Coating

Unless otherwise specified, equipment and component items, when fabricated from ferrous metal, shall be factory finished with the manufacturer's standard finish, except that items located outside of buildings shall have weather resistant finishes that will withstand 125 hours exposure to the salt spray test specified in ASTM B 117 using a 5 percent sodium chloride solution. Immediately after completion of the test, the specimen shall show no signs of blistering, wrinkling, cracking, or loss of adhesion and no sign of rust creepage beyond 3 mm on either side of the scratch mark. Cut edges of galvanized surfaces where hot-dip galvanized sheet steel is used shall be coated with a zinc-rich coating conforming to ASTM D 520, Type I.

#### 2.13.2 Factory Applied Insulation

Factory insulated items installed outdoors are not required to be fire-rated. As a minimum, factory insulated items installed indoors shall have a flame spread index no higher than 75 and a smoke developed index no higher than 150. Factory insulated items (no jacket) installed indoors and which are located in air plenums, in ceiling spaces, and in attic spaces shall have a flame spread index no higher than 25 and a smoke developed index no higher than 50. Flame spread and smoke developed indexes shall be determined by ASTM E 84. Insulation shall be tested in the same density and installed thickness as the material to be used in the actual construction. Material supplied by a manufacturer with a jacket shall be tested as a composite material. Jackets, facings, and adhesives shall have a flame spread index no higher than 25 and a smoke developed index no higher than 50 when tested in accordance with ASTM E 84.

## 2.14 SUPPLEMENTAL COMPONENTS/SERVICES

### 2.14.1 Drain and Make-Up Water Piping

Piping and backflow preventers shall comply with the requirements of Section 15400A PLUMBING, GENERAL PURPOSE. Drains which connect to sanitary sewer system shall be connected by means of an indirect waste.

### 2.14.2 Field Applied Insulation

Field applied insulation shall be provided and installed in accordance with Section 15080A THERMAL INSULATION FOR MECHANICAL SYSTEMS.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Pipe and fitting installation shall conform to the requirements of ASME B31.1. Pipe shall be cut accurately to measurements established at the jobsite, and worked into place without springing or forcing, completely clearing all windows, doors, and other openings. Cutting or other weakening of the building structure to facilitate piping installation will not be permitted without written approval. Pipe or tubing shall be cut square, shall have burrs removed by reaming, and shall permit free expansion and contraction without causing damage to the building structure, pipe, joints, or hangers.

#### 3.1.1 Directional Changes

Changes in direction shall be made with fittings, except that bending of pipe 100 mm (4 inches) and smaller will be permitted, provided a pipe bender is used and wide weep bends are formed. Mitering or notching pipe or other similar construction to form elbows or tees will not be permitted.

The centerline radius of bends shall not be less than 6 diameters of the pipe. Bent pipe showing kinks, wrinkles, flattening, or other malformations will not be accepted.

#### 3.1.2 Functional Requirements

Horizontal supply mains shall pitch down in the direction of flow as indicated. The grade shall not be less than 2 mm in 1 m. Reducing fittings shall be used for changes in pipe sizes. Open ends of pipelines and equipment shall be capped or plugged during installation to keep dirt or other foreign materials out of the system. Pipe not otherwise specified shall be uncoated. Connections to appliances shall be made with malleable iron unions for steel pipe 65 mm (2-1/2 inches) or less in diameter, and with flanges for pipe 80 mm (3 inches) and above in diameter. Connections between ferrous and copper piping shall be electrically isolated from each other with dielectric waterways or flanges. Piping located in air plenums shall conform to NFPA 90A requirements. Pipe and fittings installed in inaccessible conduits or trenches under concrete floor slabs shall be welded. Equipment and piping arrangements shall fit into space allotted and allow adequate acceptable clearances for installation, replacement, entry, servicing, and maintenance. Electric isolation fittings shall be provided between dissimilar metals.

#### 3.1.3 Fittings and End Connections

##### 3.1.3.1 Threaded Connections



Threaded connections shall be made with tapered threads and made tight with PTFE tape complying with ASTM D 3308 or equivalent thread-joint compound applied to the male threads only. Not more than three threads shall show after the joint is made.

#### 3.1.3.2 Brazed Connections

Brazing shall be performed in accordance with AWS Brazing Hdbk, except as modified herein. During brazing, the pipe and fittings shall be filled with a pressure regulated inert gas, such as nitrogen, to prevent the formation of scale. Before brazing copper joints, both the outside of the tube and the inside of the fitting shall be cleaned with a wire fitting brush until the entire joint surface is bright and clean. Brazing flux shall not be used. Surplus brazing material shall be removed at all joints. Steel tubing joints shall be made in accordance with the manufacturer's recommendations. Piping shall be supported prior to brazing and not be sprung or forced.

#### 3.1.3.3 Welded Connections

Branch connections shall be made with welding tees or forged welding branch outlets. Pipe shall be thoroughly cleaned of all scale and foreign matter before the piping is assembled. During welding, the pipe and fittings shall be filled with an inert gas, such as nitrogen, to prevent the formation of scale. Beveling, alignment, heat treatment, and inspection of weld shall conform to ASME B31.1. Weld defects shall be removed and rewelded at no additional cost to the Government. Electrodes shall be stored and dried in accordance with AWS D1.1 or as recommended by the manufacturer. Electrodes that have been wetted or that have lost any of their coating shall not be used.

#### 3.1.3.4 Grooved Mechanical Connections

Grooves shall be prepared in accordance with the coupling manufacturer's instructions. Pipe and groove dimensions shall comply with the tolerances specified by the coupling manufacturer. The diameter of grooves made in the field shall be measured using a "go/no-go" gauge, vernier or dial caliper, or narrow-land micrometer, or other method specifically approved by the coupling manufacturer for the intended application. Groove width and dimension of groove from end of pipe shall be measured and recorded for each change in grooving tool setup to verify compliance with coupling manufacturer's tolerances. Grooved joints shall not be used in concealed locations, such as behind solid walls or ceilings, unless an access panel is shown on the drawings for servicing or adjusting the joint.

#### 3.1.3.5 Flared Connections

When flared connections are used, a suitable lubricant shall be used between the back of the flare and the nut in order to avoid tearing the flare while tightening the nut.

#### 3.1.3.6 Flanges and Unions

Except where copper tubing is used, union or flanged joints shall be provided in each line immediately preceding the connection to each piece of equipment or material requiring maintenance such as coils, pumps, control valves, and other similar items. Flanged joints shall be assembled square end tight with matched flanges, gaskets, and bolts. Gaskets shall be

suitable for the intended application.

#### 3.1.4 Valves

Isolation gate or ball valves shall be installed on each side of each piece of equipment, at the midpoint of all looped mains, and at any other points indicated or required for draining, isolating, or sectionalizing purpose. Isolation valves may be omitted where balancing cocks are installed to provide both balancing and isolation functions. Each valve except check valves shall be identified. Valves in horizontal lines shall be installed with stems horizontal or above.

#### 3.1.5 Air Vents

Air vents shall be provided at all high points, on all water coils, and where indicated to ensure adequate venting of the piping system.

#### 3.1.6 Drains

Drains shall be provided at all low points and where indicated to ensure complete drainage of the piping. Drains shall be accessible, and shall consist of nipples and caps or plugged tees unless otherwise indicated.

#### 3.1.7 Flexible Pipe Connectors

Connectors shall be attached to components in strict accordance with the latest printed instructions of the manufacturer to ensure a vapor tight joint. Hangers, when required to suspend the connectors, shall be of the type recommended by the flexible pipe connector manufacturer and shall be provided at the intervals recommended.

#### 3.1.8 Temperature Gauges

Temperature gauges shall be located on coolant supply and return piping at each heat exchanger, on condenser water piping entering and leaving a condenser, at each automatic temperature control device without an integral thermometer, and where indicated or required for proper operation of equipment. Thermal wells for insertion thermometers and thermostats shall extend beyond thermal insulation surface not less than 25 mm .

#### 3.1.9 Pipe Hangers, Inserts, and Supports

Pipe hangers, inserts, and supports shall conform to MSS SP-58 and MSS SP-69, except as modified herein. Pipe hanger types 5, 12, and 26 shall not be used. Hangers used to support piping 50 mm (2 inches) and larger shall be fabricated to permit adequate adjustment after erection while still supporting the load. Piping subjected to vertical movement, when operating temperatures exceed ambient temperatures, shall be supported by variable spring hangers and supports or by constant support hangers.

##### 3.1.9.1 Hangers

Type 3 shall not be used on insulated piping. Type 24 may be used only on trapeze hanger systems or on fabricated frames.

##### 3.1.9.2 Inserts

Type 18 inserts shall be secured to concrete forms before concrete is placed. Continuous inserts which allow more adjustments may be used if

they otherwise meet the requirements for Type 18 inserts.

#### 3.1.9.3 C-Clamps

Type 19 and 23 C-clamps shall be torqued per MSS SP-69 and have both locknuts and retaining devices, furnished by the manufacturer. Field-fabricated C-clamp bodies or retaining devices are not acceptable.

#### 3.1.9.4 Angle Attachments

Type 20 attachments used on angles and channels shall be furnished with an added malleable-iron heel plate or adapter.

#### 3.1.9.5 Saddles and Shields

Where Type 39 saddle or Type 40 shield are permitted for a particular pipe attachment application, the Type 39 saddle, connected to the pipe, shall be used on all pipe 100 mm (4 inches) and larger when the temperature of the medium is 16 degrees C or higher. Type 40 shields shall be used on all piping less than 100 mm (4 inches) and all piping 100 mm (4 inches) and larger carrying medium less than 16 degrees C. A high density insulation insert of cellular glass shall be used under the Type 40 shield for piping 50 mm (2 inches) and larger.

#### 3.1.9.6 Horizontal Pipe Supports

Horizontal pipe supports shall be spaced as specified in MSS SP-69 and a support shall be installed not over 300 mm from the pipe fitting joint at each change in direction of the piping. Pipe supports shall be spaced not over 1.5 m apart at valves. Pipe hanger loads suspended from steel joist with hanger loads between panel points in excess of 23 kg shall have the excess hanger loads suspended from panel points.

#### 3.1.9.7 Vertical Pipe Supports

Vertical pipe shall be supported at each floor, except at slab-on-grade, and at intervals of not more than 4.5 m, not more than 2.4 m from end of risers, and at vent terminations.

#### 3.1.9.8 Pipe Guides

Type 35 guides using, steel, reinforced polytetrafluoroethylene (PTFE) or graphite slides shall be provided where required to allow longitudinal pipe movement. Lateral restraints shall be provided as required. Slide materials shall be suitable for the system operating temperatures, atmospheric conditions, and bearing loads encountered.

#### 3.1.9.9 Steel Slides

Where steel slides do not require provisions for restraint of lateral movement, an alternate guide method may be used. On piping 100 mm (4 inches) and larger, a Type 39 saddle shall be used. On piping under 100 mm (4 inches), a Type 40 protection shield may be attached to the pipe or insulation and freely rest on a steel slide plate.

#### 3.1.9.10 High Temperature Guides with Cradles

Where there are high system temperatures and welding to piping is not desirable, then the Type 35 guide shall include a pipe cradle, welded to

the guide structure and strapped securely to the pipe. The pipe shall be separated from the slide material by at least 100 mm, or by an amount adequate for the insulation, whichever is greater.

#### 3.1.9.11 Multiple Pipe Runs

In the support of multiple pipe runs on a common base member, a clip or clamp shall be used where each pipe crosses the base support member. Spacing of the base support members shall not exceed the hanger and support spacing required for an individual pipe in the multiple pipe run.

#### 3.1.9.12 ~~[AM0003] Seismic Requirements~~

~~Piping and attached valves shall be supported and braced to resist seismic loads as specified under Sections 13080 SEISMIC PROTECTION FOR MISCELLANEOUS EQUIPMENT and 15070A SEISMIC PROTECTION FOR MECHANICAL EQUIPMENT. Structural steel required for reinforcement to properly support piping, headers, and equipment but not shown shall be provided under this section. Material used for support shall be as specified under Section 05120A STRUCTURAL STEEL.~~

#### 3.1.9.13 Structural Attachments

Attachment to building structure concrete and masonry shall be by cast-in concrete inserts, built-in anchors, or masonry anchor devices. Inserts and anchors shall be applied with a safety factor not less than 5. Supports shall not be attached to metal decking. Masonry anchors for overhead applications shall be constructed of ferrous materials only. Structural steel brackets required to support piping, headers, and equipment, but not shown, shall be provided under this section. Material used for support shall be as specified under Section 05120A STRUCTURAL STEEL.

#### 3.1.10 Pipe Alignment Guides

Pipe alignment guides shall be provided where indicated for expansion loops, offsets, and bends and as recommended by the manufacturer for expansion joints, not to exceed 1.5 m on each side of each expansion joint, and in lines 100 mm (4 inches) or smaller not more than 600 mm on each side of the joint.

#### 3.1.11 Pipe Anchors

Anchors shall be provided wherever necessary or indicated to localize expansion or to prevent undue strain on piping. Anchors shall consist of heavy steel collars with lugs and bolts for clamping and attaching anchor braces, unless otherwise indicated. Anchor braces shall be installed in the most effective manner to secure the desired results using turnbuckles where required. Supports, anchors, or stays shall not be attached where they will injure the structure or adjacent construction during installation or by the weight of expansion of the pipeline. Where pipe and conduit penetrations of vapor barrier sealed surfaces occur, these items shall be anchored immediately adjacent to each penetrated surface, to provide essentially zero movement within penetration seal. Detailed drawings of pipe anchors shall be submitted for approval before installation.

#### 3.1.12 Building Surface Penetrations

Sleeves shall not be installed in structural members except where indicated or approved. Sleeves in nonload bearing surfaces shall be galvanized sheet

metal, conforming to ASTM A 653/A 653M, Coating Class G-90, 1.0 mm (20 gauge) . Sleeves in load bearing surfaces shall be uncoated carbon steel pipe, conforming to ASTM A 53/A 53M, Standard weight. Sealants shall be applied to moisture and oil-free surfaces and elastomers to not less than 13 mm depth. Sleeves shall not be installed in structural members.

#### 3.1.12.1 General Service Areas

Each sleeve shall extend through its respective wall, floor, or roof, and shall be cut flush with each surface. Pipes passing through concrete or masonry wall or concrete floors or roofs shall be provided with pipe sleeves fitted into place at the time of construction. Sleeves shall be of such size as to provide a minimum of 6.35 mm all-around clearance between bare pipe and sleeves or between jacketed-insulation and sleeves. Except in pipe chases or interior walls, the annular space between pipe and sleeve or between jacket over-insulation and sleeve shall be sealed in accordance with Section 07900A JOINT SEALING.

#### 3.1.12.2 Waterproof Penetrations

Pipes passing through roof or floor waterproofing membrane shall be installed through a 5.17 kg/sq. m. (17 ounce) copper sleeve, or a 0.81 mm (0.032 inch) thick aluminum sleeve, each within an integral skirt or flange. Flashing sleeve shall be suitably formed, and skirt or flange shall extend not less than 200 mm from the pipe and be set over the roof or floor membrane in a troweled coating of bituminous cement. The flashing sleeve shall extend up the pipe a minimum of 50 mm above the roof or floor penetration. The annular space between the flashing sleeve and the bare pipe or between the flashing sleeve and the metal-jacket-covered insulation shall be sealed as indicated. Penetrations shall be sealed by either one of the following methods.

- a. Waterproofing Clamping Flange: Pipes up to and including 250 mm in diameter passing through roof or floor waterproofing membrane may be installed through a cast iron sleeve with caulking recess, anchor lugs, flashing clamp device, and pressure ring with brass bolts. Waterproofing membrane shall be clamped into place and sealant shall be placed in the caulking recess.
- b. Modular Mechanical Type Sealing Assembly: In lieu of a waterproofing clamping flange, a modular mechanical type sealing assembly may be installed. Seals shall consist of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe/conduit and sleeve with corrosion protected carbon steel bolts, nuts, and pressure plates. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and each nut. After the seal assembly is properly positioned in the sleeve, tightening of the bolt shall cause the rubber sealing elements to expand and provide a watertight seal between the pipe/conduit and sleeve. Each seal assembly shall be sized as recommended by the manufacturer to fit the pipe/conduit and sleeve involved. The Contractor electing to use the modular mechanical type seals shall provide sleeves of the proper diameters.

#### 3.1.12.3 Fire-Rated Penetrations

Penetration of fire-rated walls, partitions, and floors shall be sealed as

specified in Section 07840A FIRESTOPPING.

#### 3.1.12.4 Escutcheons

Finished surfaces where exposed piping, bare or insulated, pass through floors, walls, or ceilings, except in boiler, utility, or equipment rooms, shall be provided with escutcheons. Where sleeves project slightly from floors, special deep-type escutcheons shall be used. Escutcheon shall be secured to pipe or pipe covering.

#### 3.1.13 Pumps

Support, anchor, and guide so that no strains are imposed on pump by weight or thermal movement of piping. Air vents on pump casings shall be provided. Drain outlets on pump bases shall be piped to the nearest floor or other acceptable drains, with necessary clean-out tees.

#### 3.1.14 Access Panels

Access panels shall be provided for all concealed valves, vents, controls, and items requiring inspection or maintenance. Access panels shall be of sufficient size and located so that the concealed items may be serviced and maintained or completely removed and replaced. Access panels shall be as specified in Section 05500A MISCELLANEOUS METAL.

#### 3.1.15 Field Applied Insulation

Field installed insulation shall be as specified in Section 15080A THERMAL INSULATION FOR MECHANICAL SYSTEMS, except as defined differently herein.

#### 3.1.16 Field Painting

Painting required for surfaces not otherwise specified, and finish painting of items only primed at the factory are specified in Section 09900 [AM0002] PAINTS AND COATINGS~~PAINTING, GENERAL~~.

##### 3.1.16.1 Color Coding

Color coding for piping identification is specified in Section 09900 PAINTING, GENERAL.

#### 3.2 CLEANING AND ADJUSTING

Pipes shall be cleaned free of scale and thoroughly flushed of all foreign matter. A temporary bypass shall be provided for all water coils to prevent flushing water from passing through coils. Strainers and valves shall be thoroughly cleaned. Prior to testing and balancing, air shall be removed from all water systems by operating the air vents. Temporary measures, such as piping the overflow from vents to a collecting vessel shall be taken to avoid water damage during the venting process. Air vents shall be plugged or capped after the system has been vented. Control valves and other miscellaneous equipment requiring adjustment shall be adjusted to setting indicated or directed.

#### 3.3 FIELD TESTS

Tests shall be conducted in the presence of the Contracting Officer. Water and electricity required for the tests will be furnished by the Government. Any material, equipment, instruments, and personnel required for the test

shall be provided by the Contractor. The services of a qualified technician shall be provided as required to perform all tests and procedures indicated herein. Field tests shall be coordinated with Section 15990A TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS.

### 3.3.1 Hydrostatic Tests

Following the cleaning procedures defined above, all chilled and condenser water piping systems shall be hydrostatically tested as defined herein. Unless otherwise agreed by the Contracting Officer, water (or glycol solution) shall be the test medium.

#### 3.3.1.1 Equipment and Component Isolation

Prior to testing, equipment and components that cannot withstand the test pressure shall be properly isolated.

#### 3.3.1.2 Tests

Piping shall be hydrostatically tested at a pressure equal to 150 percent of the total system operating pressure for period of time sufficient to inspect every joint in the system and in no case less than 2 hours. Test pressure shall be monitored by a calibrated, test pressure gauge. Leaks shall be repaired and piping retested until test is successful. No loss of pressure shall be allowed. Leaks shall be repaired by rewelding or replacing pipe or fittings. Caulking of joints will not be permitted. Concealed and insulated piping shall be tested in place before concealing.

### 3.3.2 Backflow Prevention Assemblies Tests

Backflow prevention assemblies shall be tested in accordance with Section 15400A PLUMBING, GENERAL PURPOSE.

## 3.4 DEMONSTRATIONS

Contractor shall conduct a training course for the operating staff as designated by the Contracting Officer. The training period shall consist of a total 16 hours of normal working time and start after the system is functionally completed but prior to final acceptance tests. The field posted instructions shall cover all of the items contained in the approved operation and maintenance manuals as well as demonstrations of routine maintenance operations.

## 3.5 ONE-YEAR INSPECTION

At the conclusion of the one year period, each connecting liquid chiller condenser shall be inspected for problems due to corrosion, scale, and biological growth. If the equipment is found not to conform to the manufacturers recommended conditions, and the water treatment company recommendations have been followed; the water treatment company shall provide all chemicals and labor for cleaning or repairing the equipment as required by the manufacturer's recommendations.

-- End of Section --

## SECTION 15500A

[AM0003] PASSIVE DESICCANT COOLING SYSTEMS

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AIR CONDITIONING AND REFRIGERATION INSTITUTE (ARI)

ARI 210/240	(1994) Unitary Air-Conditioning and Air-Source Heat Pump Equipment
ARI 700	(1999) Specifications for Fluorocarbon and Other Refrigerants
ARI 1060	(2001) Rating air to air energy recovery ventilation heat exchangers

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 307	(2000) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM B 209	(2000) Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B 209M	(2000) Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
ASTM B 210	(2000) Aluminum and Aluminum-Alloy Drawn Seamless Tubes
ASTM B 210M	(2000) Aluminum and Aluminum-Alloy Drawn Seamless Tubes (Metric)
ASTM D 1784	(1999a) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM F 104	(1995) Nonmetallic Gasket Materials

## AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 15	(1994) Safety Code for Mechanical Refrigeration
ASHRAE 34	(1997) Number Designation and Safety Classification of Refrigerants

## ASME INTERNATIONAL (ASME)



ASME B31.1 (1998) Power Piping

ASME BPVC SEC IX (1998) Boiler and Pressure Vessel Code;  
Section IX, Welding and Brazing  
Qualifications

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1 (1998) Motors and Generators

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

### SD-02 Shop Drawings

Drawings; G

Drawings, at least 5 weeks prior to beginning construction, providing adequate detail to demonstrate compliance with contract requirements. Drawings shall consist of:

- a. Equipment layouts which identify assembly and installation details to include energy recovery equipment.
- b. Piping layouts which identify all valves and fittings.
- c. Plans and elevations which identify clearances required for maintenance and operation.
- d. Wiring diagrams which identify each component individually, by showing actual location in equipment, and schematically, by showing all interconnected or interlocked relationships between components.
- e. Foundation drawings, bolt-setting information, and foundation bolts prior to concrete foundation construction for all equipment indicated or required to have concrete foundations.
- f. Details, if piping and equipment are to be supported other than as indicated, which include loading and type of frames, brackets, stanchions, or other supports.

### SD-03 Product Data

Verification of Dimensions

A letter, at least 2 weeks prior to beginning construction, indicating the date the site was visited, confirming existing conditions, and noting any discrepancies found.

Desiccant Cooling System; G

Manufacturer's catalog data, at least 5 weeks prior to beginning

construction, highlighted to show model number, size, options, performance charts and curves, etc., in adequate detail to demonstrate compliance with contract requirements. Performance charts and curves shall provide performance data over the full range of outdoor conditions for which dehumidification will be required, with the conditions defined by the Contracting Officer. Manufacturer shall supply data on all energy recovery methods and equipment available for the system. Data shall include manufacturer's recommended installation instructions and procedures. If vibration isolation is specified for a unit, vibration isolator literature shall be included containing catalog cuts and certification that the isolation characteristics of the isolators provided meet the manufacturer's recommendations.

#### Spare Parts

Spare parts data for each different item of material and equipment specified, after approval of the detail drawings and not later than 2 months prior to the date of beneficial occupancy. The data shall include a complete list of parts and supplies, with source of supply.

#### Qualifications

Six copies of qualification procedures, and list of names and identification symbols of qualified welders and welding operators, prior to non-factory welding operations.

#### Field Instructions

Posted instructions, at least 2 weeks prior to construction completion, including equipment layout, wiring and control diagrams, piping, valves and control sequences, and typed, condensed, operation instructions. The condensed operation instructions shall include preventative maintenance procedures, methods of checking the system for normal and safe operation, and procedures for safely starting and stopping the system. The posted instructions shall be framed under glass or laminated plastic and be posted where indicated by the Contracting Officer.

#### Performance Tests

Test schedules, at least 2 weeks prior to the start of the field tests and the system performance test. The schedules shall identify the date, time, and location for the performance test.

#### Demonstrations

A schedule for training demonstrations, at least 2 weeks prior to the date of the proposed training course, identifying the date, time, and location for the training.

#### SD-06 Test Reports

##### Performance Tests; G

A report documenting the data taken versus the specified performance criteria, upon completion of installation and performance testing of the system. Six copies of the bound report (

216 x 279 mm (8-1/2 x 11 inches) ) shall be provided. The report shall document compliance with the specified performance criteria upon completion and testing of the system. The report shall indicate the number of days covered by the tests and any conclusions as to the adequacy of the system. The report shall also include the following information and shall be taken at least three different times at outside dry-bulb temperatures that are at least 5 degrees C apart.

#### Inspections

A bound inspection report (216 x 279 mm (8-1/2 x 11 inches) ) at the completion of one year of service. The report shall identify the condition of the desiccant system and shall include a comparison of the condition of the desiccant system with the manufacturer's recommended operating conditions.

#### SD-07 Certificates

##### Desiccant Cooling System; G

Proof of compliance with ARI, ASHRAE, ASME, or UL requirements where specified for the system, components, or equipment. The label or listing of the specified agency shall be acceptable evidence. In lieu of the label or listing, a written certificate from an approved, nationally recognized testing organization equipped to perform such services, shall be submitted stating that the items have been tested and conform to the requirements and testing methods of the specified agency. When performance requirements of this project's drawings and specifications vary from standard ARI rating conditions, computer printouts, catalog, or other application data certified by ARI or a nationally recognized laboratory as described above shall be included. If ARI does not have a current certification program that encompasses such application data, the manufacturer shall self certify that his application data complies with project performance requirements.

#### SD-10 Operation and Maintenance Data

##### Operation and Maintenance Manuals;G

Six complete bound copies (216 x 279 mm (8-1/2 x 11 inches) ) of an operation and maintenance manual listing step-by-step procedures required for system startup, operation, maintenance, and shutdown. The manual shall include the manufacturer's name, model number, parts list, service manual, and a brief description of all equipment and their basic operating features. The manual shall include routine maintenance procedures, possible breakdowns and repairs, and a trouble shooting guide. The manuals shall include piping and equipment layouts and simplified wiring and control diagrams of the system as installed.

### 1.3 QUALIFICATIONS

Piping shall be welded in accordance with the qualified procedures, using performance qualified welders and welding operators in accordance with ASME BPVC SEC IX. Welding procedures qualified by others, and welders and welding operators qualified by another employer may be accepted as permitted by ASME B31.1. The Contracting Officer shall be notified 24 hours in advance of tests and the tests shall be performed onsite, if

practical. The welder or welding operator shall apply the assigned symbol near each weld personally made as a permanent record. Structural members shall be welded in accordance with Section 05090A WELDING, STRUCTURAL .

#### 1.4 SAFETY REQUIREMENTS

Exposed moving parts, parts that produce high operating temperature, parts which may be electrically energized, and parts that may be a hazard to operating personnel shall be insulated, fully enclosed, guarded, or fitted with other types of safety devices. Safety devices shall be installed so that proper operation of equipment is not impaired.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

All equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variations, dirt and dust, or other contaminants.

#### 1.6 PROJECT/SITE CONDITIONS

##### 1.6.1 Verification of Dimensions

After becoming familiar with all details of the work, the Contractor shall verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing any work.

##### 1.6.2 Drawings

Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. The Contractor shall carefully investigate the plumbing, fire protection, electrical, structural and any other features or conditions that would affect the work to be performed and shall arrange such work accordingly, furnishing required offsets, fittings, and accessories to meet such features or conditions.

### PART 2 PRODUCTS

#### 2.1 STANDARD PRODUCTS

Materials and equipment shall be the standard products of a manufacturer regularly engaged in the manufacturing of such products and shall essentially duplicate equipment which is similar in material, design, and workmanship. The standard products shall have been in satisfactory commercial or industrial use for two years prior to bid opening. The two-year use shall include applications of equipment and materials under similar circumstances and of similar size. The two years experience shall be satisfactorily completed by a product which has been sold or is offered for sale on the commercial market through advertisements, manufacturer's catalogs, or brochures. Products having less than a two-year field service record will be acceptable if a certified record of satisfactory field operation, for not less than 6000 hours exclusive of the manufacturer's factory tests, can be shown. All products shall be supported by a service organization. The Contractor shall submit a certified list of qualified, permanent service organizations for support of the equipment including their addresses and qualifications. These service organizations shall be reasonably convenient to the equipment installation and shall be able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract. The system shall be a

complete stand alone system with all necessary controls, motors, fans, rotors, motors, drive components, pumps, reactivation components and filtration to provide automatic continuous operation. Internal regeneration heat sources shall be a part of the system, except external heat sources may be used under the following conditions: connections to external heat sources shall be fully coordinated with the system manufacturer, and connecting equipment such as pumps, piping, traps, etc., shall be as shown on the drawings and schedules. The desiccant shall be of the solid type on a rotary wheel .

## 2.2 NAMEPLATES

Each major component of equipment shall have the manufacturer's name, address, type or style, and catalog or serial number on a plate securely attached to the item of equipment. Nameplates shall be secured to the cabinet of dry desiccant units, indicating the equipment enclosed within the cabinet behind the nameplate. Cabinets shall have hinged panels, as specified, to facilitate maintenance of the component described on the nameplate secured to the cabinet.

## 2.3 ELECTRICAL WORK

Electrical equipment, motors, motor efficiencies, and wiring shall be in accordance with Section 16415A ELECTRICAL WORK, INTERIOR. Electrical motor driven equipment specified shall be provided complete with motors, motor starters, and controls (including variable speed control of process air flow for solid units, where applicable). Electrical characteristics and enclosure type shall be as shown, and unless otherwise indicated, all motors of 1 horsepower and above with open, dripproof, or totally enclosed fan cooled enclosures, shall be high efficiency type. Field wiring shall be in accordance with manufacturer's instructions. Each motor shall conform to NEMA MG 1 and be of sufficient size to drive the equipment at the specified capacity without exceeding the nameplate rating of the motor.

All motors shall be continuous duty with the enclosure specified. Motor starters shall be provided complete with thermal overload protection and other appurtenances necessary for the motor control indicated. Motors shall be furnished with a magnetic across-the-line or reduced voltage type starter as required by the manufacturer. Motor starter shall be provided with NEMA 1 enclosures. Manual or automatic control and protective or signal devices required for the operation specified and any control wiring required for controls and devices specified, but not shown, shall be provided.

## 2.4 MATERIALS

### 2.4.1 Gaskets

Gaskets shall conform to ASTM F 104 classification for compressed sheet with nitrile binder and acrylic fibers for maximum 371 degrees C service.

### 2.4.2 Bolts and Nuts

Bolts and nuts, except as required for piping applications, shall be in accordance with ASTM A 307. The bolt head shall be marked to identify the manufacturer and the standard with which the bolt complies in accordance with ASTM A 307.

## 2.5 DESICCANT SYSTEMS

### 2.5.1 Solid Desiccant System

The unit shall be a complete, factory assembled and tested system, suitable for indoor installation. Each unit shall produce a capacity as rated in accordance with ARI 1060. It shall be designed for either curb mounting or structural steel support. The unit shall include the following components as defined in paragraph SYSTEM COMPONENTS:

- a. Desiccant Rotor
- b. Supply Fan
- c. ~~[AM003]Return Regeneration Fan~~
- d. ~~[AM0003] Dehumidification/Cooling coilRegeneration and Process Heating System~~
- e. Filters

#### 2.5.1.1 Control Package

Each unit shall be factory wired and equipped with a central electrical control panel mounted inside the service compartment. Variable-speed drive controller, if provided, shall also be mounted inside the service compartment. Switched lighting shall be provided in the service compartment so that the panel can be easily seen. Compartment shall be ventilated, if necessary, for cooling variable speed drive controller. A single power supply shall be required. All internal wiring shall be in accordance with the National Electrical Code. All electrical components required for automatic operation, based on signals from remotely mounted humidity and temperature sensors/controllers, shall be included. Connections to remote devices shall be made at the marked terminals. The internal control panel shall report discharge temperature and humidity. Additional reporting of all control data shall be available to a central control station, as specified in Section 15950A HEATING< VENTILATING< AND AIR CONDITIONING (HVAC) CONTROL SYSTEMS.

#### 2.5.1.2 Unit Mounting

The unit shall be structural steel supported. The entire unit shall be isolated from the building structure on vibration isolators with submitted and published load ratings. Vibration isolators shall have isolation characteristics as recommended by the manufacturer for the unit supplied and the service intended.

### 2.6 SYSTEM COMPONENTS

#### 2.6.1 ~~[AM0003] Passive~~Desiccant Rotor

~~[AM0003]Dehumidifiers Rotor~~ shall be non-cyclic adsorption type with a single desiccant rotary structure designed for continuous operation. Construction arrangement shall provide counter flow of ~~[AM0003]processsupply~~ and ~~[AM0003]regenerationreturn~~ air streams with full face pressure seals to prevent cross leakage with static pressure differentials up to 200 mm water gauge. The rotary structure shall consist of a stable, hygroscopic desiccant material, such as ~~[AM0003]Molecular Sieve~~, Silica Gel, Titanium Silicate, or a Zeolite, deposited on a honey-combed substrate designed to maximize the desiccant area exposed to the air stream and minimize the thermal carryover from the ~~[AM0003]regenerationreturn~~ side to the ~~[AM0003]adsorption~~supply side. The design shall ensure laminar air flow through the structure for minimum pressure loss. The rotor shall be complete with an electric motor with over-current protection and a speed reducer assembly

driving the rotor through a flexible circumferential drive belt. A slack side belt tensioner shall be included for automatic take-up.

## 2.6.2 Heat Exchanger

### 2.6.2.1 ~~Thermal Rotor~~[AM0003]

~~The thermal rotor shall be of the rotary, non-hygroscopic type, to minimize the transfer of water vapor between the process and regeneration sides of the unit. The rotor shall be constructed and sized to maximize the transfer of heat from the supply air stream to the regeneration air stream while minimizing the transfer of moisture back to the supply air stream. Supply and cooling air streams shall be counter flow and the component fitted with full face contact seals on both sides to prevent leakage.~~

### 2.6.3 Fans (~~Solid~~[AM0003]~~Passive~~ Desiccant System) For Supply and ~~Return~~[AM0003]~~Regeneration~~

The unit shall be equipped with two belt driven backward inclined blowers. A drive belt rated for minimum 150% of motor horsepower shall be used on each motor. The supply fan motor shall have sheaves for air balancing. The motors shall be nominal 3500 RPM, NEMA B with open dripproof housings and a minimum service factor of 1.15.

### 2.6.4 Heating and Cooling System (~~Solid~~[AM0003]~~Passive~~ Desiccant System)

~~[AM0003] Supply~~~~Regeneration and process~~ heating coils shall be of the finned tube type, and shall be constructed of 13 mm OD seamless copper tube mechanically bonded to aluminum fins. The coils shall include a flanged, heavy-gauge, galvanized steel housing for mounting to the unit. The coils shall be rated for 1135.6 kPa.

### 2.6.5 Filters (~~Solid~~[AM0003]~~Passive~~ Desiccant System)

Outside air inlets and return air plenums shall be equipped with 50 mm, ~~[AM0002] 65%~~30% minimum efficiency filters. Filters shall be pleated and disposable.

## 2.7 UNIT CONSTRUCTION

### 2.7.1 ~~Solid~~[AM0003]~~Passive~~ Desiccant System

Unit shall be suitable for ~~[AM0003] indoor~~outdoor installation. ~~[AM0003] It shall be designed for either structural or curb mounting without field modification. The enclosure system shall be air-tight (2% maximum leakage at 150% design static pressure from section to section)~~~~[AM0003] 2" double wall~~. The unit base shall be constructed of formed minimum 10 GA steel coated with red-oxide primer. Cross members shall be located to support each major component. Lifting lugs shall be fitted to appropriate structural members. Unit exterior shall be painted with a low-gloss enamel.

#### 2.7.1.1 Housing

The unit housing ~~[AM0003]~~shall be constructed of 18 ga galvanized steel, internal partitions of 22 ga. galvanized steel with 50mm (2 inch) double wall with 3# insulation and internal partitions shall be constructed of minimum 18 GA galvanized steel with the exterior panels treated to allow for painting. All external walls shall be~~[AM0003] 50mm (2 inch) double wall with 3# insulation~~ insulated with foil-faced fiber glass insulation at

~~least 25 mm thick and secured by permanent mechanical fasteners welded to the panels. Adjoining panels shall be sealed by permanent mechanical fasteners welded to the panels. Adjoining panels shall be sealed to one another with silicone compound, as specified in Section 15080A THERMAL INSULATION FOR MECHANICAL SYSTEMS.~~

#### 2.7.1.2 Service Panels

Removable service access panels shall be provided for all components. The openings shall be of sufficient size to allow service to all maintenance items. All service panels shall be provided with resilient gaskets and hardware to assure compression. Access doors shall be provided for boiler and control sections and shall have continuous hinges. Roof panels shall be sealed to provide a weather-tight enclosure.

### 2.8 DUCT WORK

#### 2.8.1 Plenums and Ductwork

Desiccant units shall be provided with flanges on the air openings for duct connection. Inlet and outlet plenums shall be bolted to the flange with a gasket between the connection. Access doors, for servicing diffusers and eliminators, shall be provided in the inlet and outlet plenums. Inlet ductwork must be designed to allow uniform distribution of air across the entire opening. Outlet plenums and ductwork must allow adequate room for servicing the eliminators and must provide proper airflow through the equipment. Plenum and ductwork sizes shall be as shown and specified in Section 15895A AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM.

#### 2.8.2 ~~[AM0003]Regenerator Exhaust Ductwork~~

~~The regenerator exhaust ductwork shall be made of glass fiber reinforced polyester (FRP) or monel. FRP must be rated for continuous duty at 82 degrees C. Duct joints should be of watertight construction. The exhaust plenum and duct should incorporate a drip collar to capture any condensation that occurs inside the duct. Long horizontal duct runs should be pitched slightly in the direction of air flow, and shall incorporate low point condensate drains.~~

### 2.9 SUPPLEMENTAL COMPONENTS/SERVICES

#### 2.9.1 Drain and Makeup Water Piping

Piping shall comply with the requirements of Section 15400A PLUMBING, GENERAL PURPOSE. Drains which connect to sanitary sewer system shall be connected by means of an indirect waste.

## PART 3 EXECUTION

### 3.1 INSTALLATION

All work shall be performed in accordance with the manufacturer's published diagrams, recommendations, and equipment warranty requirements.

### 3.2 EQUIPMENT

Necessary supports shall be provided for all equipment, appurtenances, and pipe as required, including frames or supports. Housings shall be isolated from the building structure. If mechanical vibration isolators are not



provided, vibration absorbing foundations shall be furnished. Each foundation shall include isolation units consisting of machine and floor or foundation fastenings, together with intermediate isolation material. Other floor-mounted equipment shall be set on not less than a 150 mm concrete pad doweled in place. Concrete foundations for floor mounted pumps shall have a mass equivalent to three times the weight of the components, pump, base plate, and motor to be supported. In lieu of concrete pad foundation, concrete pedestal block with isolators placed between the pedestal block and the floor may be provided. Concrete pedestal block shall be of mass not less than three times the combined pump, motor, and base weights. Isolators shall be selected and sized based on load-bearing requirements and the lowest frequency of vibration to be isolated. Isolators shall limit vibration to 80 percent at lowest equipment rpm. Lines connected to pumps mounted on pedestal blocks shall be provided with flexible connectors. Foundation drawings, bolt-setting information, and foundation bolts shall be furnished prior to concrete foundation construction for all equipment indicated or required to have concrete foundations. Concrete for foundations and concrete-structured or cast-cooling towers shall be as specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE. Equipment shall be properly leveled, aligned, and secured in place in accordance with manufacturer's instructions.

### 3.2.1 Conditioner Solution Concentration

Contractor shall provide the conditioner solution concentration capable of maintaining the humidity level specified on the drawings.

### 3.2.2 Automatic Controls

Automatic controls for the specified desiccant system shall be provided with the desiccant equipment. These controls shall operate automatically to balance the equipment capacity with the load on the air conditioning system, and shall be fully coordinated with and integrated into the temperature control system specified in Sections 15895A AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM and 15950A HEATING, VENTILATING AND AIR CONDITIONING (HVAC) CONTROL SYSTEMS.

### 3.2.3 General Piping, Valves, and Duct Installation

All piping, valve, and duct installation shall be made in accordance with the desiccant equipment manufacturers recommendation or in accordance with Sections 15895A AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM, 15181A CHILLED WATER PIPING AND ACCESSORIES, and 15400A PLUMBING, GENERAL PURPOSE.

## 3.3 PERFORMANCE TESTS

Before each desiccant system is accepted, tests to demonstrate the general operating characteristics of all equipment shall be conducted by a registered professional engineer or an approved manufacturer's startup representative experienced in system startup and testing, at such times as directed. The tests shall measure quantities listed below. Tests shall cover a period of not less than 2 days for each system and shall demonstrate that the entire system is functioning in accordance with the drawings and specifications. Corrections and adjustments shall be made as necessary and tests shall be re-conducted to demonstrate that the entire system is simultaneously functioning as specified. A report shall be prepared for each desiccant system, including the information outlined below. Data for the tests shall be taken at least three different times at

outside wet-bulb temperatures which are at least 3 degrees C apart.

### 3.3.1 [AM0003] PassiveSolid (Wheel) Desiccant System:

- a. Date and outside weather conditions (at least two parameters to define the state of the outside air: DB, Gr./LB, Wb, relative humidity).
- b. The load on the system based on the following:
  - (1) CFM entering the system ([AM0003] SupplyProcess and RegenerationReturn).
  - (2) [AM0003] Outside Air Entering ConditionsProcess side-- entering air conditions (Db, Gr./LB).
  - (3) [AM0003] Chilled Water Coil Discharge ConditionsProcess side-- discharge air conditions (Db, Gr./LB).
  - (4) [AM0003] Supply AirProcess side-- post coolant capacity (tons).
  - (5) [AM0003] Return AirRegenerator side-- entering air conditions (Db, Gr./LB).
  - (6) [AM0003] Exhaust Air Regenerator side-- discharge air conditions (Db, Gr./LB).
  - (7) [AM0003] Hot Water Coil CapacityRegenerator side-- heat source capacity (Btu/hr).
  - (8) Running current, voltage and proper phase sequence for each phase of all motors.
  - (9) The actual on-site setting of all operating and safety controls.

### 3.4 PIPE COLOR CODE MARKING

Color code marking of piping shall be as specified in Section 09900 [AM0002] PAINTS AND COATINGS PAINTING, GENERAL.

### 3.5 INSPECTIONS

The manufacturer of the liquid desiccant system shall supply, free of charge, testing of solution samples sent to them by the customer every two months for the life of the equipment. The manufacturer of each type system shall inspect the systems after one year of operation to insure the systems are operating properly.

### 3.6 MANUFACTURER'S FIELD SERVICE

The services of a factory-trained representative shall be provided for 2 days. The representative shall advise on the proper operation and servicing of the equipment and make any adjustments necessary to insure full compliance with design criteria.

### 3.7 CLEANING AND ADJUSTING

Equipment shall be wiped clean, with all traces of oil, dust, dirt, or paint spots removed. Temporary filters shall be provided for all fans that are operated during construction, and new filters shall be installed after all construction dirt has been removed from the building. System shall be maintained in this clean condition until final acceptance. Bearings shall be properly lubricated with oil or grease as recommended by the manufacturer. Belts shall be tightened to proper tension. Control valves and other miscellaneous equipment requiring adjustment shall be adjusted to the setting indicated or directed. Fans shall be adjusted to the speed

indicated by the manufacturer to meet specified conditions.

### 3.8 DEMONSTRATIONS

Contractor shall conduct a training course for the operating staff as designated by the Contracting Officer. The training period shall consist of a total 4 hours of normal working time and start after the system is functionally completed but prior to final acceptance tests. The field instructions shall cover all of the items contained in the Operation and Maintenance Manuals as well as demonstrations of routine maintenance operations.

### 3.9 SERVICE CONTRACT

Contractor shall provide a five (5) year, unconditional maintenance contract for the Desiccant cooling system (symbol ERU) to include the [AM0003] passivedesiccant wheel, lubrication, [AM0002] fansfan, belts, motors, VFD, dampers, coils, and filters as required for periodic replacement.

### 3.10 [AM0002] FRAMED CHARTS AND GRAPHICS

Install framed charts and graphics with a glass cover on the wall of the mechanical room. The chart and graphics shall indicate all control components contained within the unit and its associated location. Nominal operating temperatures shall be identified on the graphics and listed in the chart as a function of the Outside Air and Return/Exhaust Air. The chart and graphics shall be presented in a manner that the maintenance personnel can use them to calculate and determine Supply Air to coils and other factors needed to verify performance of the unit without the need of a computer interface.

-- End of Section --

## SECTION 15620A

## LIQUID CHILLERS

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AIR CONDITIONING AND REFRIGERATION INSTITUTE (ARI)

ARI 450	(1999) Water-Cooled Refrigerant Condensers, Remote Type
ARI 460	(2000) Remote Mechanical-Draft Air-Cooled Refrigerant Condensers
ARI 480	(1995) Refrigerant-Cooled Liquid Coolers, Remote Type
ARI 495	(1999) Refrigerant Liquid Receivers
ARI 550/590	(1998) Water-Chilling Packages Using the Vapor Compression Cycle
ARI 560	(1992) Absorption Water Chilling and Water Heating Packages
ARI 575	(1994) Method of Measuring Machinery Sound Within an Equipment Space
ARI 700	(1999) Specifications for Fluorocarbon and Other Refrigerants
ARI 740	(1998) Refrigerant Recovery/Recycling Equipment

## AMERICAN BEARING MANUFACTURERS ASSOCIATION (ABMA)

ABMA 11	(1990; R 1999) Load Ratings and Fatigue Life for Roller Bearings
ABMA 9	(1990; R 2000) Load Ratings and Fatigue Life for Ball Bearings

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 307	(2000) Carbon Steel Bolts and Studs, 60
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## 000 PSI Tensile Strength

ASTM B 117	(1997) Operating Salt Spray (Fog) Apparatus
ASTM D 520	(2000) Zinc Dust Pigment
ASTM E 84	(2000a) Surface Burning Characteristics of Building Materials
ASTM F 104	(1995) Nonmetallic Gasket Materials

## AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 15	(1994) Safety Code for Mechanical Refrigeration
ASHRAE 34	(1997) Number Designation and Safety Classification of Refrigerants
ASHRAE 64	(1995) Methods of Testing Remote Mechanical-Draft Evaporative Refrigerant Condensers

## AMERICAN WELDING SOCIETY (AWS)

AWS Z49.1	(1999) Safety in Welding and Cutting
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## ASME INTERNATIONAL (ASME)

ASME BPVC SEC IX	(1998) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications
ASME BPVC SEC VIII D1	(1998) Boiler and Pressure Vessel Code; Section VIII, Pressure Vessels Division 1 - Basic Coverage

## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1	(1998) Motors and Generators
NEMA MG 2	(1989) Safety Standard for Construction and Guide for Selection, Installation, and Use of Electric Motors and Generators
NEMA SM 23	(1991) Steam Turbines for Mechanical Drive Service

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 37	(2002) Installation and Use of Stationary Combustion Engines and Gas Turbines
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NFPA 54 (1999) National Fuel Gas Code

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE J 537 (1996) Storage Batteries

UNDERWRITERS LABORATORIES (UL)

UL 1236 (1994; Rev thru Mar 1999) Battery Chargers  
for Charging Engine-Starter Batteries

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

### SD-02 Shop Drawings

Drawings; ,  
Installation; ,

Drawings, at least 5 weeks prior to beginning construction, provided in adequate detail to demonstrate compliance with contract requirements. Drawings shall consist of:

- a. Equipment layouts which identify assembly and installation details.
- b. Plans and elevations which identify clearances required for maintenance and operation.
- c. Wiring diagrams which identify each component individually and all interconnected or interlocked relationships between components.
- d. Foundation drawings, bolt-setting information, and foundation bolts prior to concrete foundation construction for all equipment indicated or required to have concrete foundations.
- e. Details, if piping and equipment are to be supported other than as indicated, which include loadings and type of frames, brackets, stanchions, or other supports.

### SD-03 Product Data

Refrigeration System; G,

Manufacturer's standard catalog data, at least 5 weeks prior to the purchase or installation of a particular component, highlighted to show material, size, options, performance charts and curves, etc. in adequate detail to demonstrate compliance with contract requirements. Data shall include manufacturer's

recommended installation instructions and procedures. Data shall be adequate to demonstrate compliance with contract requirements as specified within the paragraphs:

- a. Liquid Chiller
- b. Chiller Components
- c. Accessories

If vibration isolation is specified for a unit, vibration isolator literature shall be included containing catalog cuts and certification that the isolation characteristics of the isolators provided meet the manufacturer's recommendations.

Spare Parts; ,

Spare parts data for each different item of equipment specified, after approval of detail drawings and not later than months prior to the date of beneficial occupancy. The data shall include a complete list of parts and supplies, with current unit prices and source of supply, a recommended spare parts list for 1 year of operation, and a list of the parts recommended by the manufacturer to be replaced on a routine basis.

Posted Instructions; ,

Posted instructions, at least 2 weeks prior to construction completion, including equipment layout, wiring and control diagrams, piping, valves and control sequences, and typed condensed operation instructions. The condensed operation instructions shall include preventative maintenance procedures, methods of checking the system for normal and safe operation, and procedures for safely starting and stopping the system. The posted instructions shall be framed under glass or laminated plastic and be posted where indicated by the Contracting Officer.

Verification of Dimensions; ,

A letter, at least 2 weeks prior to beginning construction, including the date the site was visited, conformation of existing conditions, and any discrepancies found.

Manufacturer's Multi-Year Compressor Warranty; ,

Manufacturer's multi-year warranty for compressor(s) in air-cooled liquid chillers as specified.

~~[AM003]Factory Tests; ,~~

~~Schedules, at least 2 weeks prior to the factory test, which identify the date, time, and location for each test. Schedules shall be submitted for both the Chiller Performance Test and the Chiller Sound Test.~~

## System Performance Tests; ,

A schedule, at least 2 weeks prior to the start of related testing, for the system performance tests. The schedules shall identify the proposed date, time, and location for each test.

## Demonstrations; ,

A schedule, at least 2 weeks prior to the date of the proposed training course, which identifies the date, time, and location for the training.

## SD-06 Test Reports

~~[AM003]Factory Tests; ,~~

~~Six copies of the report shall be provided in bound 216 x 279 mm (8 1/2 x 11 inch) booklets. Reports shall certify the compliance with performance requirements and follow the format of the required testing standard for both the Chiller Performance Tests and the Chiller Sound Tests. Test report shall include certified calibration report of all test instrumentation. Calibration report shall include certification that all test instrumentation has been calibrated within 6 months prior to the test date, identification of all instrumentation, and certification that all instrumentation complies with requirements of the test standard. Test report shall be submitted 1 week after completion of the factory test.~~

## System Performance Tests; ,

Six copies of the report shall be provided in bound 216 x 279 (8 1/2 x 11 inch) booklets. The report shall document compliance with the specified performance criteria upon completion and testing of the system. The report shall indicate the number of days covered by the tests and any conclusions as to the adequacy of the system. The report shall also include the following information and shall be taken at least three different times at outside dry-bulb temperatures that are at least 3 degrees C (5 degrees F) apart:

- a. Date and outside weather conditions.
- b. The load on the system based on the following:
  - (1) The refrigerant used in the system.
  - (2) Condensing temperature and pressure.
  - (3) Suction temperature and pressure.
  - (4) Running current, voltage and proper phase sequence for each phase of all motors.
  - (5) The actual on-site setting of all operating and safety controls.
  - (6) Chilled water pressure, flow and temperature in and out of the chiller.
  - (7) The position of the capacity-reduction gear at machine off,



one-third loaded, one-half loaded, two-thirds loaded, and fully loaded.

#### SD-07 Certificates

##### Refrigeration System; ,

Where the system, components, or equipment are specified to comply with requirements of AGA, NFPA, ARI, ASHRAE, ASME, or UL, 1 copy of proof of such compliance shall be provided. The label or listing of the specified agency shall be acceptable evidence. In lieu of the label or listing, a written certificate from an approved, nationally recognized testing organization equipped to perform such services, stating that the items have been tested and conform to the requirements and testing methods of the specified agency may be submitted. When performance requirements of this project's drawings and specifications vary from standard ARI rating conditions, computer printouts, catalog, or other application data certified by ARI or a nationally recognized laboratory as described above shall be included. If ARI does not have a current certification program that encompasses such application data, the manufacturer may self certify that his application data complies with project performance requirements in accordance with the specified test standards.

##### Service Organization; ,

A certified list of qualified permanent service organizations for support of the equipment which includes their addresses and qualifications. The service organizations shall be reasonably convenient to the equipment installation and be able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

#### SD-10 Operation and Maintenance Data

##### Operation Manuals; ,

Six complete copies of an operation manual in bound 216 x 279 (8 1/2 x 11 inch) booklets listing step-by-step procedures required for system startup, operation, abnormal shutdown, emergency shutdown, and normal shutdown at least 4 weeks prior to the first training course. The booklets shall include the manufacturer's name, model number, and parts list. The manuals shall include the manufacturer's name, model number, service manual, and a brief description of all equipment and their basic operating features.

##### Maintenance Manuals; ,

Six complete copies of maintenance manual in bound 216 x 279 (8 1/2 x 11 inch) booklets listing routine maintenance procedures, possible breakdowns and repairs, and a trouble shooting guide. The manuals shall include piping and equipment layouts and simplified wiring and control diagrams of the system as installed.

### 1.3 SAFETY REQUIREMENTS

Exposed moving parts, parts that produce high operating temperature, parts which may be electrically energized, and parts that may be a hazard to operating personnel shall be insulated, fully enclosed, guarded, or fitted with other types of safety devices. Safety devices shall be installed so that proper operation of equipment is not impaired. Welding and cutting safety requirements shall be in accordance with AWS Z49.1.

### 1.4 DELIVERY, STORAGE, AND HANDLING

Stored items shall be protected from the weather, humidity and temperature variations, dirt and dust, or other contaminants. Proper protection and care of all material both before and during installation shall be the Contractor's responsibility. Any materials found to be damaged shall be replaced at the Contractor's expense. During installation, piping and similar openings shall be capped to keep out dirt and other foreign matter.

### 1.5 PROJECT/SITE CONDITIONS

#### 1.5.1 Verification of Dimensions

The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

#### 1.5.2 Drawings

Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. The Contractor shall carefully investigate the plumbing, fire protection, electrical, structural and finish conditions that would affect the work to be performed and shall arrange such work accordingly, furnishing required offsets, fittings, and accessories to meet such conditions.

### 1.6 MANUFACTURER'S MULTI-YEAR COMPRESSOR WARRANTY

The Contractor shall provide a 5 year parts only (excludes refrigerant) manufacturer's warranty on the air-cooled chiller compressor(s). This warranty shall be directly from the chiller manufacturer to the Government and shall be in addition to the standard one-year warranty of construction.

The manufacturer's warranty shall provide for the repair or replacement of the chiller compressor(s) that become inoperative as a result of defects in material or workmanship within 5 years after the date of final acceptance. When the manufacturer determines that a compressor requires replacement, the manufacturer shall furnish new compressor(s) at no additional cost to the Government. Upon notification that a chiller compressor has failed under the terms of the warranty, the manufacturer shall respond in no more than 6 hours. Response shall mean having a manufacturer-qualified technician onsite to evaluate the extent of the needed repairs. The warranty period shall begin on the same date as final acceptance and shall continue for the full product warranty period.

#### 1.6.1 Local Service Representative

The Contractor shall furnish with each manufacturer's multi-year warranty the name, address, and telephone number (day, night, weekend, and holiday) of the service representative nearest to the location where the equipment is installed. Upon a request for service under the multi-year warranty, the service representative shall honor the warranty during the warranty period, and shall provide the services prescribed by the terms of the warranty.

#### 1.6.2 Equipment Warranty Tags

At the time of installation, each item of manufacturer's multi-year warranted equipment shall be tagged with a durable, oil- and water-resistant tag, suitable for interior and exterior locations, resistant to solvents, abrasion, and fading due to sunlight. The tag shall be attached with copper wire or a permanent, pressure-sensitive, adhesive backing. The tag shall be installed in an easily noticed location attached to the warranted equipment. The tag for this equipment shall be similar to the following in format, and shall contain all of the listed information:

##### MANUFACTURER'S MULTI-YEAR WARRANTY EQUIPMENT TAG

Equipment/Product Covered: \_\_\_\_\_

Manufacturer:\_\_\_\_\_Model No.:\_\_\_\_\_Serial No.:\_\_\_\_\_

Warranty Period: From \_\_\_\_\_to \_\_\_\_\_

Contract No.: \_\_\_\_\_

Warranty Contact: \_\_\_\_\_

Name: \_\_\_\_\_

Address: \_\_\_\_\_

Telephone: \_\_\_\_\_

STATION PERSONNEL SHALL PERFORM PREVENTIVE  
MAINTENANCE AND OPERATIONAL MAINTENANCE

## PART 2 PRODUCTS

### 2.1 STANDARD COMMERCIAL PRODUCTS

Materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacturing of such products, which are of a similar material, design and workmanship. The standard products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2 year use shall include applications of equipment and materials under similar circumstances and of similar size. The 2 years experience shall be satisfactorily completed by a product which has been sold or is offered for sale on the commercial market through advertisements, manufacturer's catalogs, or brochures. Products having less than a 2 year field service record shall be acceptable if a certified record of satisfactory field operation, for not less than 6000 hours exclusive of the manufacturer's factory tests, can be shown. Products shall be supported by a service organization. System components shall be environmentally suitable for the indicated locations.

### 2.2 NAMEPLATES

Major equipment including chillers, compressors, compressor drivers,

condensers, liquid coolers, receivers, refrigerant leak detectors, heat exchanges, fans, and motors shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the item of equipment. Plates shall be durable and legible throughout equipment life and made of anodized aluminum. Plates shall be fixed in prominent locations with nonferrous screws or bolts.

### 2.3 ELECTRICAL WORK

Electrical equipment, motors, motor efficiencies, and wiring shall be in accordance with Section 16415A ELECTRICAL WORK, INTERIOR. Electrical motor driven equipment specified shall be provided complete with motors, motor starters, and controls. Electrical characteristics shall be as shown, and unless otherwise indicated, all motors of 746 kW (1 hp) and above with open, dripproof, totally enclosed, or explosion proof fan cooled enclosures, shall be high efficiency type. Field wiring shall be in accordance with manufacturer's instructions. Each motor shall conform to NEMA MG 1 and NEMA MG 2 and be of sufficient size to drive the equipment at the specified capacity without exceeding the nameplate rating of the motor.

Motors shall be continuous duty with the enclosure specified. Motor starters shall be provided complete with thermal overload protection and other appurtenances necessary for the motor control indicated. Motors shall be furnished with a magnetic across-the-line or reduced voltage type starter as required by the manufacturer. Motor duty requirements shall allow for maximum frequency start-stop operation and minimum encountered interval between start and stop. Motors shall be sized for the applicable loads. Motor torque shall be capable of accelerating the connected load within 20 seconds with 80 percent of the rated voltage maintained at motor terminals during one starting period. Motor bearings shall be fitted with grease supply fittings and grease relief to outside of enclosure. Manual or automatic control and protective or signal devices required for the operation specified and any control wiring required for controls and devices specified, but not shown, shall be provided.

### 2.4 SELF-CONTAINED LIQUID CHILLER

Unless necessary for delivery purposes, units shall be assembled, leak-tested, charged (refrigerant and oil), and adjusted at the factory. In lieu of delivery constraints, a chiller may be assembled, leak-tested, charged (refrigerant and oil), and adjusted at the job site by a factory representative. Unit components delivered separately shall be sealed and charged with a nitrogen holding charge. Unit assembly shall be completed in strict accordance with manufacturer's recommendations. Chiller shall operate within capacity range and speed recommended by the manufacturer. Parts weighing 23 kg or more which must be removed for inspection, cleaning, or repair, such as motors, gear boxes, cylinder heads, casing tops, condenser, and cooler heads, shall have lifting eyes or lugs. Chiller shall include all customary auxiliaries deemed necessary by the manufacturer for safe, controlled, automatic operation of the equipment. Chiller shall be provided with a single point wiring connection for incoming power supply. Chiller's condenser and liquid cooler shall be provided with standard water boxes with flanged connections.

#### 2.4.1 [AM0003] Rotary Screw Type

Chiller shall be constructed and rated in accordance with ARI 550/590. Chiller shall be conform to ASHRAE 15. Chiller shall have a minimum full load COP rating of 9.2 and a part load COP rating of 1.22 in accordance with ARI 550/590. As a minimum, chiller shall include the following components as defined in paragraph CHILLER COMPONENTS.

- a. Refrigerant and oil
- b. Structural base
- c. Chiller refrigerant circuit
- d. Controls package
- e. Rotary screw compressor
- f. Compressor driver, electric motor
- g. Compressor driver connection
- h. Liquid cooler (evaporator)
- i. Air-cooled condenser coil
- j. Tools

## 2.5 LIQUID CHILLER

Total chiller system shall be constructed and rated in accordance with ARI 550/590. Individual chiller components shall be constructed and rated in accordance with the applicable ARI standards. Chiller system shall be conform to ASHRAE 15. Chiller shall be assembled, leak-tested, charged (refrigerant and oil), and adjusted at the job site in strict accordance with manufacturer's recommendations. Unit components delivered separately shall be sealed and charged with a nitrogen holding charge. Unit assembly shall be completed in strict accordance with manufacturer's recommendations. Chiller shall operate within capacity range and speed recommended by the manufacturer. Parts weighing 23 kg or more which must be removed for inspection, cleaning, or repair, shall have lifting eyes or lugs. Chiller shall include all customary auxiliaries deemed necessary by the manufacturer for safe, controlled, automatic operation of the equipment. Chiller's condenser and liquid cooler shall be provided with standard water boxes with flanged connections. As a minimum, chiller shall include the following components as defined in paragraph CHILLER COMPONENTS.

- a. Refrigerant and oil
- b. Structural base
- c. Chiller refrigerant circuit
- d. Controls package

e. Receiver

f. Tools

#### 2.5.1 Compressor-Chiller Unit

As a minimum, the compressor-chiller unit shall include the following components as defined in paragraph CHILLER COMPONENTS.

- a. Rotary screw compressor
- b. Compressor driver, electric motor
- c. Compressor driver connection
- d. Liquid cooler (evaporator)

#### 2.5.2 Air-Cooled Condenser

Condenser shall be a factory-fabricated and assembled unit, consisting of coils, fans, and electric motor drive. Condenser shall be constructed and rated in accordance with ARI 460. Unless the condenser coil is completely protected through inherent design, louvered panel coil guards shall be provided by the manufacturer to prevent physical damage to the coil. Manufacturer shall certify that the condenser and associated equipment are designed for the submitted condensing temperature. For design conditions, if matched combination catalog ratings matching remote condensers to compressors are not available, the Contractor shall furnish a crossplotting of the gross heat rejection of the condenser against the gross heat rejection of the compressor, for the design conditions to show the compatibility of the equipment furnished.

##### 2.5.2.1 Condenser Casing

Condenser casing shall be aluminum not less than 2 mm (0.080 inch) or hot-dip galvanized steel not lighter than 1.2 mm (18 gauge) .

##### 2.5.2.2 Coil

Condenser coil shall be of the extended-surface fin-and-tube type and shall be constructed of seamless copper tubes with compatible aluminum fins. Fins shall be soldered or mechanically bonded to the tubes and installed in a metal casing. Coils shall be circuited and sized for a minimum of 3 degrees C subcooling and full pumpdown capacity. Coil shall be factory leak and pressure tested after assembly in accordance with ASHRAE 15.

##### 2.5.2.3 Fans

Fans shall be centrifugal or propeller type as best suited for the application. Fans shall be direct or V-belt driven. Belt drives shall be completely enclosed within the unit casing or equipped with a guard. When belt drive is provided, an adjustable sheave to furnish not less than 20 percent fan-speed adjustment shall be provided. Sheaves shall be selected to provide the capacity indicated at the approximate midpoint of the

adjustment. Fans shall be statically and dynamically balanced.

## 2.6 CHILLER COMPONENTS

### 2.6.1 Refrigerant and Oil

Refrigerants shall be one of the fluorocarbon gases. Refrigerants shall have number designations and safety classifications in accordance with ASHRAE 34. Refrigerants shall meet the requirements of ARI 700 as a minimum. Refrigerants shall have an Ozone Depletion Potential (ODP) of less than or equal to 0.05.

### 2.6.2 Structural Base

Chiller and individual chiller components shall be provided with a factory-mounted structural steel base (welded or bolted) or support legs. Chiller and individual chiller components shall be isolated from the building structure by means of molded neoprene isolation pads.

### 2.6.3 Chiller Refrigerant Circuit

Chiller refrigerant circuit shall be completely piped and factory leak tested. For multicompressor units, not less than 2 independent refrigerant circuits shall be provided. Circuit shall include as a minimum a combination filter and drier, combination sight glass and moisture indicator, liquid-line solenoid valve for reciprocating, an electronic or thermostatic expansion valve with external equalizer, charging ports, compressor service valves for field-serviceable compressors, and superheat adjustment.

### 2.6.4 Controls Package

Chiller shall be provided with a complete factory-mounted , prewired electric or microprocessor based control system. Controls package shall contain as a minimum a digital display or acceptable gauges, an on-auto-off switch, motor starters, disconnect switches, power wiring, and control wiring. Controls package shall provide operating controls, monitoring capabilities, programmable setpoints, safety controls, and EMCS interfaces as defined below.

#### 2.6.4.1 Operating Controls

Chiller shall be provided with the following adjustable operating controls as a minimum.

- a. Leaving chilled water temperature control
- b. Adjustable timer or automated controls to prevent a compressor from short cycling
- c. Automatic lead/lag controls (adjustable) for multi-compressor units
- d. Load limiting

- e. System capacity control to adjust the unit capacity in accordance with the system load and the programmable setpoints. Controls shall automatically re-cycle the chiller on power interruption.
- f. Startup and head pressure controls to allow system operation at all ambient temperatures down to 5 degrees C
- g. Fan sequencing for air-cooled condenser

#### 2.6.4.2 Monitoring Capabilities

During normal operations, the control system shall be capable of monitoring and displaying the following operating parameters. Access and operation of display shall not require opening or removing any panels or doors.

- a. Entering and leaving chilled water temperatures
- b. Self diagnostic
- c. Operation status
- d. Operating hours
- e. Number of starts
- f. Compressor status (on or off)
- g. Refrigerant discharge and suction pressures
- h. Oil pressure

#### 2.6.4.3 Programmable Setpoints

The control system shall be capable of being reprogrammed directly at the unit. The programmable setpoints shall include the following as a minimum.

- a. Leaving Chilled Water Temperature

#### 2.6.4.4 Safety Controls with Manual Reset

Chiller shall be provided with the following safety controls which automatically shutdown the chiller and which require manual reset.

- a. Low chilled water temperature protection
- b. High condenser refrigerant discharge pressure protection
- c. Low evaporator pressure protection
- d. Chilled water flow detection
- e. High motor winding temperature protection



- f. Low oil flow protection if applicable

#### 2.6.4.5 Safety Controls with Automatic Reset

Chiller shall be provided with the following safety controls which automatically shutdown the chiller and which provide automatic reset.

- a. Over/under voltage protection
- b. Chilled water flow interlock

#### 2.6.4.6 Remote Alarm

During the initiation of a safety shutdown, a chiller's control system shall be capable of activating a remote alarm bell. In coordination with the chiller, the contractor shall provide an alarm circuit (including transformer if applicable) and a minimum 100 mm (4 inch) diameter alarm bell. Alarm circuit shall activate bell in the event of machine shutdown due to the chiller's monitoring of safety controls. The alarm bell shall not sound for a chiller that uses low-pressure cutout as an operating control.

#### 2.6.4.7 Energy Management Control System (EMCS) Interface

The control system shall be capable of communicating all data to a remote integrated DDC processor through a single shielded cable. The data shall include as a minimum all system operating conditions, capacity controls, and safety shutdown conditions. The control system shall also be capable of receiving at a minimum the following operating commands.

- a. Remote Unit Start/Stop
- b. Remote Chilled Water Reset
- c. —

#### 2.6.5 Compressor(s)

##### 2.6.5.1 [AM003]~~Reciprocating Compressor(s)~~

~~Rotating parts shall be statically and dynamically balanced at the factory to minimize vibration. Compressors shall be capable of operating at partial load conditions without increased vibration over the normal vibration at full load operation and shall be capable of continuous operation down to the lowest step of unloading as specified. Compressors of size 7.45 kW (10 horsepower) and above shall have an oil lubrication system of the reversible, forced feed type with oil strainer. Shaft seal in open type units shall be mechanical type. Piston speed for open type compressors shall not exceed the manufacturer's recommendation or 6 m/s (1200 fpm), whichever is less. Compressors shall include:~~

- ~~a. Vertical, V, W, or radial cylinder design~~

~~b. Oil lubrication~~

~~e. Integrally cast block of close grained iron or cast aluminum block with hardened steel cylinder sleeves~~

~~d. Oil level bull's eye~~

~~e. Cast cylinder heads~~

~~f. Cast aluminum or forged steel connecting rods~~

~~g. Cast iron or forged steel crankshaft~~

~~h. Main bearings of the sleeve insert type~~

~~i. Crankcase oil heaters controlled as recommended by the manufacturer~~

~~j. Suction and discharge refrigerant service valves that are flange connected, wrench operated, with cap~~

~~k. A strainer on the suction side of the compressor~~

#### 2.6.5.2 Rotary Screw Compressor(s)

Compressors shall operate stably for indefinite time periods at any stage of capacity reduction without hot-gas bypass. Provision shall be made to insure proper lubrication of bearings and shaft seals on shutdown with or without electric power supply. Rotary screw compressors shall include:

- a. An open or hermetic, positive displacement, oil-injected design directly driven by the compressor driver. Compressor shall allow access to internal compressor components for repairs, inspection, and replacement of parts.
- b. Rotors which are solid steel forging with sufficient rigidity for proper operation.
- c. A maximum rotor operating speed no greater than 3600 RPM.
- d. Casings of cast iron, precision machined for minimal clearance about periphery of rotors.
- e. A lubrication system of the forced-feed type that provides oil at the proper pressure to all parts requiring lubrication.
- f. Shaft main bearings of the sleeve type with heavy duty bushings or rolling element type in accordance with ABMA 9 or ABMA 11. Bearings shall be conservatively loaded and rated for an L(10) life of not less than 200,000 hours.
- g. A differential oil pressure or flow cutout to allow the compressor to operate only when the required oil pressure or flow is provided to the bearings.

- h. A temperature- or pressure-initiated, hydraulically actuated, single-slide-valve, capacity-control system to provide minimum automatic capacity modulation from 100 percent to 15 percent.
- i. An oil separator and oil return system to remove oil entrained in the refrigerant gas and automatically return the oil to the compressor.
- j. Crankcase oil heaters controlled as recommended by the manufacturer.

#### 2.6.6 Compressor Driver, Electric Motor

Motors, starters, , wiring, etc. shall be in accordance with paragraph ELECTRICAL WORK. Motor starter shall be unit mounted as indicated with starter type, wiring, and accessories coordinated with the chiller manufacturer. Starter shall be able to operate in temperatures up to 120 degrees F.

#### 2.6.7 Compressor Driver Connections

Each machine driven through speed-increasing gears shall be so designed as to assure self-alignment, interchangeable parts, proper lubrication system, and minimum unbalanced forces. Bearings shall be of the sleeve or roller type. Gear cases shall be oil tight. Shaft extensions shall be provided with seals to retain oil and exclude all dust.

#### 2.6.8 Liquid Cooler (Evaporator)

Cooler shall be of the shell-and-coil or shell-and-tube type design. Condenser's refrigerant side shall be designed and factory pressure tested to comply with ASHRAE 15. Condenser's water side shall be designed and factory pressure tested for not less than 1,000 kPa. Cooler shell shall be constructed of seamless or welded steel. Coil bundles shall be totally removable and arranged to drain completely. Tubes shall be seamless copper, plain, integrally finned with smooth bore or integrally finned with enhanced bore. Each tube shall be individually replaceable. Tubes shall be installed into carbon mild steel tube sheets by rolling. Tube baffles shall be properly spaced to provide adequate tube support and cross flow. Performance shall be based on a water velocity not less than 0.91 m/s (3 fps) nor more than 3.7 m/s (12 fps) and a fouling factor of [AM0002] 0.01762 sq. m k/kw (0.0001 sq. ft. -hr- degree F/Btu) 0.0005.

#### 2.6.9 Air-Cooled Condenser Coil

Condenser coil shall be of the extended-surface fin-and-tube type and shall be constructed of seamless copper tubes with compatible aluminum fins. Fins shall be soldered or mechanically bonded to the tubes and installed in a metal casing. Coils shall be circuited and sized for a minimum of 3 degrees C subcooling and full pumpdown capacity. Coil shall be factory leak and pressure tested after assembly in accordance with ASHRAE 15. Coil shall be entirely coated with the manufacturer's standard epoxy or vinyl coating.

#### 2.6.10 Receivers

Liquid receivers not already specified herein as an integral factory-mounted part of a package, shall be designed, fitted, and rated in accordance with the recommendations of ARI 495, except as modified herein. Receiver shall bear a stamp certifying compliance with ASME BPVC SEC VIII D1 and shall meet the requirements of ASHRAE 15. Inner surfaces shall be thoroughly cleaned by sandblasting or other approved means. Each receiver shall have a storage capacity not less than 20 percent in excess of that required for the fully-charged system. Each receiver shall be equipped with inlet, outlet drop pipe, drain plug, purging valve, relief valves of capacity and setting required by ASHRAE 15, and two bull's eye liquid-level sight glasses. Sight glasses shall be in the same vertical plane, 90 degrees apart, perpendicular to the axis of the receiver, and not over 75 mm horizontally from the drop pipe measured along the axis of the receiver. In lieu of bull's eye sight glass, external gauge glass with metal glass guard and automatic closing stop valves may be provided.

#### 2.6.11 Tools

One complete set of special tools, as recommended by the manufacturer for field maintenance of the system, shall be provided. Tools shall be mounted on a tool board in the equipment room or contained in a toolbox as directed by the Contracting Officer.

#### 2.7 ACCESSORIES

##### 2.7.1 Refrigerant Signs

Refrigerant signs shall be a medium-weight aluminum type with a baked enamel finish. Signs shall be suitable for indoor or outdoor service. Signs shall have a white background with red letters not less than 12 mm in height.

##### 2.7.1.1 Installation Identification

Each new refrigerating system shall be provided with a refrigerant sign which indicates the following as a minimum:

- a. Contractor's name.
- b. Refrigerant number and amount of refrigerant.
- c. The lubricant identity and amount.
- d. Field test pressure applied.

##### 2.7.1.2 Controls and Piping Identification

Refrigerant systems containing more than 50 kg of refrigerant shall be provided with refrigerant signs which designate the following as a minimum:

- a. Valves or switches for controlling the refrigerant flow and the refrigerant compressor(s).

b. Pressure limiting device(s).

#### 2.7.2 Refrigerant Recovery/Recycle System

A manually initiated refrigerant recovery/recycle system shall be provided, consisting of a motor-driven, air- or water-cooled, reciprocating condensing unit and a receiver of sufficient capacity to store the entire refrigerant charge of the largest water-chilling system. For refrigerants with atmospheric pressure boiling temperature below 20 degrees C the receiver shall be sized so that it is no more than 80 percent full at 32 degrees C. For refrigerants with atmospheric pressure boiling temperature above 20 degrees C, the receiver shall be sized so that it is no more than 90 percent full at 32 degrees C. The recovery/recycle system condensing unit shall be assembled as a complete unit and meet the requirements of ASHRAE 15. The system components shall be portable and shall include all valves, connections, and controls required for operation. Receiver and relief devices shall conform to the requirements of ASME BPVC SEC VIII D1. The recovery/recycle system shall be tested and listed to conform to ARI 740 for refrigerant recovery/recycle systems by a recognized national testing laboratory. For refrigerants with atmospheric pressure boiling temperature below 20 degrees C, the recovery/recycle unit shall have an ARI 740 vapor refrigerant recovery rate of no less than 8.5 kg/minute. For refrigerants with atmospheric pressure boiling temperature above 20 degrees C, the recovery/recycle unit shall have an ARI 740 vapor refrigerant recovery rate of no less than 1.0 kg/minute.

#### 2.7.3 Gaskets

Gaskets shall conform to ASTM F 104 - classification for compressed sheet with nitrile binder and acrylic fibers for maximum 371 degrees C (700 degrees F) service.

#### 2.7.4 Bolts and Nuts

Bolts and nuts, except as required for piping applications, shall be in accordance with ASTM A 307. The bolt head shall be marked to identify the manufacturer and the standard with which the bolt complies in accordance with ASTM A 307.

### 2.8 FABRICATION

#### 2.8.1 Factory Coating

Unless otherwise specified, equipment and component items, when fabricated from ferrous metal, shall be factory finished with the manufacturer's standard finish, except that items located outside of buildings shall have weather resistant finishes that will withstand 500 hours exposure to the salt spray test specified in ASTM B 117 using a 5 percent sodium chloride solution. Immediately after completion of the test, the specimen shall show no signs of blistering, wrinkling, cracking, or loss of adhesion and no sign of rust creepage beyond 3 mm on either side of the scratch mark. Cut edges of galvanized surfaces where hot-dip galvanized sheet steel is used shall be coated with a zinc-rich coating conforming to ASTM D 520,

Type I.

#### 2.8.2 Factory Applied Insulation

Chiller shall be provided with factory installed insulation on surfaces subject to sweating including the liquid cooler, suction line piping, economizer, and cooling lines. Insulation on heads of coolers may be field applied, however it shall be installed to provide easy removal and replacement of heads without damage to the insulation. Where motors are the gas-cooled type, factory installed insulation shall be provided on the cold-gas inlet connection to the motor per manufacturer's standard practice. Factory insulated items installed outdoors are not required to be fire-rated. As a minimum, factory insulated items installed indoors shall have a flame spread index no higher than 75 and a smoke developed index no higher than 150. Factory insulated items (no jacket) installed indoors and which are located in air plenums, in ceiling spaces, and in attic spaces shall have a flame spread index no higher than 25 and a smoke developed index no higher than 50. Flame spread and smoke developed indexes shall be determined by ASTM E 84. Insulation shall be tested in the same density and installed thickness as the material to be used in the actual construction. Material supplied by a manufacturer with a jacket shall be tested as a composite material. Jackets, facings, and adhesives shall have a flame spread index no higher than 25 and a smoke developed index no higher than 50 when tested in accordance with ASTM E 84.

#### 2.9 SUPPLEMENTAL COMPONENTS/SERVICES

##### 2.9.1 Chilled Water Piping and Accessories

Chilled water piping and accessories shall be provided and installed in accordance with Section 15181A CHILLED WATER PIPING AND ACCESSORIES.

##### 2.9.2 Temperature Controls

Chiller control packages shall be fully coordinated with and integrated into the temperature control system specified in Section 15895A AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM and 15950A HEATING, VENTILATING AND AIR CONDITIONING (HVAC) CONTROL SYSTEMS .

#### PART 3 EXECUTION

##### 3.1 INSTALLATION

Work shall be performed in accordance with the manufacturer's published diagrams, recommendations, and equipment warranty requirements. Where equipment is specified to conform to the requirements of ASME BPVC SEC VIII D and ASME BPVC SEC IX, the design, fabrication, and installation of the system shall conform to ASME BPVC SEC VIII D1 and ASME BPVC SEC IX.

##### 3.2 MANUFACTURER'S FIELD SERVICE

The services of a factory-trained representative shall be provided for 2 days. The representative shall advise on the following:

## a. Hermetic machines:

- (1) Testing hermetic water-chilling unit under pressure for refrigerant leaks; evacuation and dehydration of machine to an absolute pressure of not over 300 microns.
- (2) Charging the machine with refrigerant.
- (3) Starting the machine.

## 3.3 CLEANING AND ADJUSTING

Equipment shall be wiped clean, with all traces of oil, dust, dirt, or paint spots removed. Temporary filters shall be provided for all fans that are operated during construction, and new filters shall be installed after all construction dirt has been removed from the building. System shall be maintained in this clean condition until final acceptance. Bearings shall be properly lubricated with oil or grease as recommended by the manufacturer. Belts shall be tightened to proper tension. Control valves and other miscellaneous equipment requiring adjustment shall be adjusted to setting indicated or directed. Fans shall be adjusted to the speed indicated by the manufacturer to meet specified conditions. Testing, adjusting, and balancing shall be as specified in Section 15990A TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS.

## 3.4 SYSTEM PERFORMANCE TESTS

Before each refrigeration system is accepted, tests to demonstrate the general operating characteristics of all equipment shall be conducted by a registered professional engineer or an approved manufacturer's start-up representative experienced in system start-up and testing, at such times as directed. Tests shall cover a period of not less than 48 hours for each system and shall demonstrate that the entire system is functioning in accordance with the drawings and specifications. Corrections and adjustments shall be made as necessary and tests shall be re-conducted to demonstrate that the entire system is functioning as specified. Prior to acceptance, service valve seal caps and blanks over gauge points shall be installed and tightened. Any refrigerant lost during the system startup shall be replaced. If tests do not demonstrate satisfactory system performance, deficiencies shall be corrected and the system shall be retested. Tests shall be conducted in the presence of the Contracting Officer. Water and electricity required for the tests will be furnished by the Government. Any material, equipment, instruments, and personnel required for the test shall be provided by the Contractor. Field tests shall be coordinated with Section 15990A TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS.

## 3.5 DEMONSTRATIONS

Contractor shall conduct a training course for the operating staff as designated by the Contracting Officer. The training period shall consist of a total 8 hours of normal working time and start after the system is functionally completed but prior to final acceptance tests. The field posted instructions shall cover all of the items contained in the approved

operation and maintenance manuals as well as demonstrations of routine maintenance operations.

-- End of Section --



## SECTION 16710A

## PREMISES DISTRIBUTION SYSTEM

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## ELECTRONIC INDUSTRIES ALLIANCE (EIA)

EIA ANSI/TIA/EIA-568-A	(1995) Commercial Building Telecommunications Cabling Standard
EIA ANSI/TIA/EIA-568-A-5	(2000) Transmission Performance Specifications for 4-pair 100 ohm Category 5E Cabling
EIA ANSI/TIA/EIA-569-A	(1998) Commercial Building Standard for Telecommunications Pathways and Spaces
EIA ANSI/TIA/EIA-606	(1993) Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
EIA ANSI/TIA/EIA-607	(1994) Commercial Building Grounding and Bonding Requirements for Telecommunications
EIA TIA/EIA-TSB-67	(1995) Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems

## IBM CORPORATION (IBM)

IBM GA27-3361-07	(1987) LAN Cabling System - Planning and Installation
IBM GA27-3773-0	(1987) Cabling System Technical Interface Specifications

## INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)

ICEA S-80-576	(1994) Communications Wire and Cable for Wiring of Premises
ICEA S-83-596	(1994) Fiber Optic Premises Distribution Cable

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70

(1999) National Electrical Code

## UNDERWRITERS LABORATORIES (UL)

UL 50

(1995; Rev thru Nov 1999) Enclosures for  
Electrical Equipment

## 1.2 SYSTEM DESCRIPTION

The premises distribution system shall consist of inside-plant horizontal, riser, and backbone cables and connecting hardware to transport telephone and data (including LAN) signals between equipment items in a building.

## 1.3 ENVIRONMENTAL REQUIREMENTS

Connecting hardware shall be rated for operation under ambient conditions of 0 to 60 degrees C and in the range of 0 to 95 percent relative humidity, noncondensing.

## 1.4 QUALIFICATIONS

## 1.4.1 Minimum Contractor Qualifications

All work under this section shall be performed by and all equipment shall be furnished and installed by a certified Telecommunications Contractor, hereafter referred to as the Contractor. The Contractor shall have the following qualifications in Telecommunications Systems installation:

- a. Contractor shall have a minimum of 3 years experience in the application, installation and testing of the specified systems and equipment.
- b. All supervisors and installers assigned to the installation of this system or any of its components shall have factory certification from each equipment manufacturer that they are qualified to install and test the provided products.
- c. All installers assigned to the installation of this system or any of its components shall have a minimum of 3 years experience in the installation of the specified copper and fiber optic cable and components.

## 1.4.2 Minimum Manufacturer Qualifications

The equipment and hardware provided under this contract will be from manufacturers that have a minimum of 3 years experience in producing the types of systems and equipment specified.

## 1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When

used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Premises Distribution System; G.

Detail drawings including a complete list of equipment and material. Detail drawings shall contain complete wiring and schematic diagrams and other details required to demonstrate that the system has been coordinated and will function properly as a system. Drawings shall include vertical riser diagrams, equipment rack details, elevation drawings of telecommunications closet walls, outlet face plate details for all outlet configurations, sizes and types of all cables, conduits, and cable trays. Drawings shall show proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearance for maintenance and operation.

Record Drawings; G.

Record drawings for the installed wiring system infrastructure per EIA ANSI/TIA/EIA-606. The drawings shall show the location of all cable terminations and location and routing of all backbone and horizontal cables. The identifier for each termination and cable shall appear on the drawings.

SD-03 Product Data

Record Keeping and Documentation; G.

Documentation on cables and termination hardware in accordance with EIA ANSI/TIA/EIA-606.

Spare Parts; G.

Lists of spare parts, tools, and test equipment for each different item of material and equipment specified, after approval of detail drawings, not later than 2 months prior to the date of beneficial occupancy. The data shall include a complete list of parts and supplies, with current unit prices and source of supply, and a list of spare parts recommended for stocking.

Manufacturer's Recommendations; G.

Where installation procedures, or any part thereof, are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations, prior to installation shall be provided. Installation of the item will not be allowed to proceed until the recommendations are received and approved.

Test Plan; G.

Test plan defining the tests required to ensure that the system meets technical, operational and performance specifications, 60 days prior to the proposed test date. The test plan must be approved before the start of any testing. The test plan shall identify the capabilities and functions to be tested, and include detailed instructions for the setup and execution of each test and procedures for evaluation and documentation of the results.

Qualifications; G.

The qualifications of the Manufacturer, Contractor, and the Installer to perform the work specified herein. This shall include proof of the minimum qualifications specified herein.

#### SD-06 Test Reports

Test Reports; G.

Test reports in booklet form with witness signatures verifying execution of tests. Test results will also be provided on 89 mm diskettes in ASCII format. Reports shall show the field tests performed to verify compliance with the specified performance criteria. Test reports shall include record of the physical parameters verified during testing. Test reports shall be submitted within 14 days after completion of testing.

#### SD-07 Certificates

Premises Distribution System; G.

Written certification that the premises distribution system complies with the EIA ANSI/TIA/EIA-568-A, EIA ANSI/TIA/EIA-569-A, and EIA ANSI/TIA/EIA-606 standards.

Materials and Equipment; G.

Where materials or equipment are specified to conform, be constructed or tested to meet specific requirements, certification that the items provided conform to such requirements. Certification by a nationally recognized testing laboratory that a representative sample has been tested to meet the requirements, or a published catalog specification statement to the effect that the item meets the referenced standard, will be acceptable as evidence that the item conforms. Compliance with these requirements does not relieve the Contractor from compliance with other requirements of the specifications.

Installers; G.

The Contractor shall submit certification that all the installers are factory certified to install and test the provided products.

## 1.6 DELIVERY AND STORAGE

Equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variation, dirt and dust or other contaminants.

## 1.7 OPERATION AND MAINTENANCE MANUALS

Commercial off the shelf manuals shall be furnished for operation, installation, configuration, and maintenance for all products provided as a part of the premises distribution system. Specification sheets for all cable, connectors, and other equipment shall be provided.

## 1.8 RECORD KEEPING AND DOCUMENTATION

### 1.8.1 Cables

A record of all installed cable shall be provided on electronic media using Windows based computer cable management software per EIA ANSI/TIA/EIA-606. A licensed copy of the cable management software including documentation, shall be provided. The cable records shall include only the required data fields per EIA ANSI/TIA/EIA-606.

### 1.8.2 Termination Hardware

A record of all installed patch panels and outlets shall be provided on electronic media using Windows based computer cable management software per EIA ANSI/TIA/EIA-606. A licensed copy of the cable management software including documentation, shall be provided. The hardware records shall include only the required data fields per EIA ANSI/TIA/EIA-606.

## PART 2 PRODUCTS

### 2.1 MATERIALS AND EQUIPMENT

Materials and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products and shall be the manufacturer's latest standard design that has been in satisfactory use for at least 1 year prior to installation. Materials and equipment shall conform to the respective publications and other requirements specified below and to the applicable requirements of NFPA 70.

### 2.2 UNSHIELDED TWISTED PAIR CABLE SYSTEM

#### 2.2.1 Backbone Cable

Backbone cable shall meet the requirements of ICEA S-80-576 and EIA ANSI/TIA/EIA-568-A for Category 5 100-ohm unshielded twisted pair cable. Cable shall be label-verified. Cable jacket shall be factory marked at regular intervals indicating verifying organization and performance level. Conductors shall be solid untinned copper 24 AWG . Cable shall be rated CMP per NFPA 70.

#### 2.2.2 Horizontal Cable

Horizontal cable shall meet the requirements of EIA ANSI/TIA/EIA-568-A-5 for Category 5e. Cable shall be label-verified. Cable jacket shall be factory marked at regular intervals indicating verifying organization and performance level. Cable shall be rated CMG or CMP, as appropriate, per NFPA 70.

#### 2.2.3 Connecting Hardware

Connecting and cross-connecting hardware shall be the same category as the cable it serves. Hardware shall be in accordance with EIA ANSI/TIA/EIA-568-A.

##### 2.2.3.1 Telecommunications Outlets

Wall and desk outlet plates shall come equipped with two modular jacks, with the top or left jack labeled "voice" and the bottom or right jack labeled "data". Modular jacks shall be the same category as the cable they terminate and shall meet the requirements of EIA ANSI/TIA/EIA-568-A. Modular jack pin/pair configuration shall be T568A per EIA ANSI/TIA/EIA-568-A. Modular jacks shall be keyed. Faceplates shall be provided and shall be ivory in color. Mounting plates shall be provided for system furniture and shall match the system furniture in color. Outlet assemblies used in the premises distribution system shall consist of modular jacks assembled into both simplex and duplex outlet assemblies in single or double gang covers as specified in this section and as indicated on the drawings. The modular jacks shall conform to the requirements of EIA ANSI/TIA/EIA-568-A, and shall be rated for use with Category 5e cable in accordance with EIA ANSI/TIA/EIA-568-A-5 and shall meet the Link Test parameters as listed in EIA TIA/EIA TSB-67 and supplemented by EIA ANSI/TIA/EIA-568-A-5.

##### 2.2.3.2 Patch Panels

Patch panels shall consist of eight-position modular jacks, with rear mounted type 110 insulation displacement connectors, arranged in rows or columns on wall mounted panels. Jack pin/pair configuration shall be T568A per EIA ANSI/TIA/EIA-568-A. Jacks shall be keyed. Panels shall be provided with labeling space. The modular jacks shall conform to the requirements of EIA ANSI/TIA/EIA-568-A, and shall be rated for use with Category 5e cable in accordance with EIA ANSI/TIA/EIA-568-A-5 and shall meet the Link Test parameters as listed in EIA TIA/EIA-TSB-67 and supplemented by EIA ANSI/TIA/EIA-568-A-5.

##### 2.2.3.3 Patch Cords

Patch cords shall be cable assemblies consisting of flexible, twisted pair stranded wire with eight-position plugs at each end. Cable shall be label-verified. Cable jacket shall be factory marked at regular intervals indicating verifying organization and performance level. Patch cords shall be wired straight through; pin numbers shall be identical at each end and shall be paired to match T568A patch panel jack wiring per EIA ANSI/TIA/EIA-568-A. Patch cords shall be keyed. Patch cords shall be factory assembled. Patch cords shall conform to the requirements of EIA

ANSI/TIA/EIA-568-A-5 for Category 5e.

#### 2.2.3.4 Terminal Blocks

Terminal blocks shall be wall mounted wire termination units consisting of insulation displacement connectors mounted in plastic blocks, frames or housings. Blocks shall be type 110 which meet the requirements of EIA ANSI/TIA/EIA-568-A, and shall be rated for use with Category 5e cable in accordance with EIA ANSI/TIA/EIA-568-A-5 and shall meet the Link Test parameters as listed in EIA TIA/EIA TSB-67 and supplemented by EIA ANSI/TIA/EIA-568-A-5. Blocks shall be mounted on standoffs and shall include cable management hardware. Insulation displacement connectors shall terminate 22 or 24 gauge solid copper wire as a minimum, and shall be connected in pairs so that horizontal cable and connected jumper wires are on separate connected terminals.

### 2.3 SHIELDED TWISTED PAIR CABLE SYSTEM

#### 2.3.1 Backbone Cable

Backbone cable shall meet the requirements of IBM GA27-3773-0 for 150 ohm Shielded Twisted Pair Cable and shall meet or exceed IBM performance requirements for Type 1A cable. Cable shall be label-verified. Cable jacket shall be factory marked at regular intervals indicating verifying organization and performance level. Cable shall be rated CMR per NFPA 70.

#### 2.3.2 Horizontal Cable

Horizontal cable shall meet the requirements of IBM GA27-3773-0 for 150 ohm Shielded Twisted Pair Cable and shall meet or exceed IBM performance requirements for Type 1A cable. Cable shall be label-verified. Cable jacket shall be factory marked at regular intervals indicating verifying organization and performance level. Cable shall be rated CMP per NFPA 70.

#### 2.3.3 Connecting Hardware

##### 2.3.3.1 Connectors

Connectors for shielded twisted pair cable shall meet the requirements of EIA ANSI/TIA/EIA-568-A for media interface connectors and IBM GA27-3773-0 for Type 1A data connectors. Connectors shall be of hermaphroditic design and shall be utilized for outlets and patch panel terminations. Outlet faceplates shall be provided and shall be ivory in color, , single gang . Mounting plates shall be provided for systems furniture and shall match the systems furniture in color.

##### 2.3.3.2 Patch Panels

Patch panels shall be wall mounted panels with openings for shielded twisted pair connectors. Panels shall be non-metallic. Patch panels shall provide strain relief for cables. Panels shall be provided with labeling space.

##### 2.3.3.3 Patch Cords

Patch cords shall be cable assemblies consisting of flexible shielded twisted pair cable with shielded twisted pair type connectors at each end. Cable shall meet the requirements of IBM GA27-3773-0 for 150 ohm Shielded Twisted Pair Cable and shall meet or exceed performance requirements for Type 6A patch panel data cable. Connectors shall meet or exceed the requirements of EIA ANSI/TIA/EIA-568-A for media interface connectors. Patch cords shall be factory assembled.

## 2.4 FIBER OPTIC CABLE SYSTEM

### 2.4.1 Connecting Hardware

#### 2.4.1.1 Connectors

Connectors shall be SC type with ceramic ferrule material with a maximum insertion loss of .5 dB. Connectors shall meet performance requirements of EIA ANSI/TIA/EIA-568-A. Connectors shall be field installable. Connectors shall utilize adhesive for fiber attachment to ferrule. Connectors shall terminate fiber sizes as required for the service. Station cable faceplates shall be provided and shall be ivory in color, impact resistant plastic, single gang, with double-sided female SC coupler. Mounting plates shall be provided for system furniture and shall match the furniture system in color.

#### 2.4.1.2 Patch Panels

Patch panels shall be a complete system of components by a single manufacturer, and shall provide termination, splice storage, routing, radius limiting, cable fastening, storage, and cross-connection. Patch panels shall be wall mounted panels. Patch panels shall provide strain relief for cables. Panels shall be provided with labeling space. Patch panel connectors and couplers shall be the same type and configuration as used elsewhere in the system.

#### 2.4.1.3 Patch Cords

Patch cords shall be cable assemblies consisting of flexible optical fiber cable with connectors of the same type as used elsewhere in the system. Optical fiber shall be the same type as used elsewhere in the system. Patch cords shall be complete assemblies from manufacturer's standard product lines.

## 2.5 EQUIPMENT MOUNTING BACKBOARD

Plywood backboards shall be provided, sized as shown, painted with white or light colored paint.

## 2.6 TELECOMMUNICATIONS OUTLET BOXES

Electrical boxes for telecommunication outlets shall be 117 mm square by 53 mm deep with minimum 9 mm deep single or two gang plaster ring as shown. Provide a minimum 25 mm conduit.



## PART 3 EXECUTION

## 3.1 INSTALLATION

System components and appurtenances shall be installed in accordance with NFPA 70, manufacturer's instructions and as shown. Necessary interconnections, services, and adjustments required for [AM0003] for a ~~complete and operable~~ signal distribution system {AM0003} as shown shall be provided. Components shall be labeled in accordance with EIA ANSI/TIA/EIA-606. Penetrations in fire-rated construction shall be firestopped in accordance with Section 07840 FIRESTOPPING. Conduits, outlets and raceways shall be installed in accordance with Section 16415 ELECTRICAL WORK, INTERIOR. Wiring shall be installed in accordance with EIA ANSI/TIA/EIA-568-A and as specified in Section 16415 ELECTRICAL WORK, INTERIOR. Wiring, and terminal blocks and outlets shall be marked in accordance with EIA ANSI/TIA/EIA-606. Cables shall not be installed in the same cable tray, utility pole compartment, or floor trench compartment with ac power cables. Cables not installed in conduit or wireways shall be properly secured and neat in appearance and, if installed in plenums or other spaces used for environmental air, shall comply with NFPA 70 requirements for this type of installation.

## 3.1.1 Horizontal Distribution Cable

The rated cable pulling tension shall not be exceeded. Cable shall not be stressed such that twisting, stretching or kinking occurs. Cable shall not be spliced. Fiber optic cables shall be installed either in conduit or through type cable trays to prevent microbending losses. Copper cable not in a wireway shall be suspended a minimum of 200 mm above ceilings by cable supports no greater than 1.5 m apart. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items. Placement of cable parallel to power conductors shall be avoided, if possible; a minimum separation of 300 mm (12 inches) shall be maintained when such placement cannot be avoided. Cables shall be terminated; no cable shall contain unterminated elements. Minimum bending radius shall not be exceeded during installation or once installed. Cable ties shall not be excessively tightened such that the transmission characteristics of the cable are altered.

## 3.1.2 Riser and Backbone Cable

Vertical cable support intervals shall be in accordance with manufacturer's recommendations. Cable bend radius shall not be less than ten times the outside diameter of the cable during installation and once installed. Maximum tensile strength rating of the cable shall not be exceeded. Cable shall not be spliced.

## 3.1.3 Telecommunications Outlets

## 3.1.3.1 Faceplates

As a minimum each jack shall be labeled as to its function and a unique number to identify cable link.

### 3.1.3.2 Cables

Unshielded twisted pair and fiber optic cables shall have a minimum of 150 mm of slack cable loosely coiled into the telecommunications outlet boxes. Minimum manufacturers bend radius for each type of cable shall not be exceeded.

### 3.1.3.3 Pull Cords

Pull cords shall be installed in all conduit serving telecommunications outlets which do not initially have fiber optic cable installed.

### 3.1.4 Terminal Blocks

Terminal blocks shall be mounted in orderly rows and columns. Adequate vertical and horizontal wire routing areas shall be provided between groups of blocks. Industry standard wire routing guides shall be utilized.

### 3.1.5 Unshielded Twisted Pair Patch Panels

Patch panels shall be mounted in equipment racks with sufficient modular jacks to accommodate the installed cable plant plus 10 percent spares. Cable guides shall be provided above, below and between each panel.

## 3.2 TERMINATION

Cables and conductors shall sweep into termination areas; cables and conductors shall not bend at right angles. Manufacturer's minimum bending radius shall not be exceeded. When there are multiple system type drops to individual workstations, relative position for each system shall be maintained on each system termination block or patch panel.

### 3.2.1 Unshielded Twisted Pair Cable

Each pair shall be terminated on appropriate outlets, terminal blocks or patch panels. No cable shall be unterminated or contain unterminated elements. Pairs shall remain twisted together to within the proper distance from the termination as specified in EIA ANSI/TIA/EIA-568-A. Conductors shall not be damaged when removing insulation. Wire insulation shall not be damaged when removing outer jacket.

### 3.2.2 Shielded Twisted Pair Cable

Each cable shall be terminated on panel-mounted connectors. Cables shall be grounded at patch panels using manufacturer's recommended methods. Shield braid shall be continuous to connector braid terminator. Wire insulation shall not be damaged when removing shield.

## 3.3 GROUNDING

Signal distribution system ground shall be installed in the telecommunications entrance facility and in each telecommunications closet in accordance with EIA ANSI/TIA/EIA-607 and Section 16415 ELECTRICAL WORK, INTERIOR. Equipment racks shall be connected to the electrical safety

ground.

### 3.4 ADDITIONAL MATERIALS

The Contractor shall provide the following additional materials required for facility startup.

- a. 10 of each type outlet.
- b. 10 of each type cover plate.
- c. 1 of each type terminal block for each telecommunications closet.
- d. 4 Patch cords of 3 m for each telecommunications closet.
- e. 1 Set of any and all special tools required to establish a cross connect and to change and/or maintain a terminal block.

### 3.5 ADMINISTRATION AND LABELING

#### 3.5.1 Labeling

##### 3.5.1.1 Labels

All labels shall be in accordance with EIA ANSI/TIA/EIA-606.

##### 3.5.1.2 Cable

All cables will be labeled using color labels on both ends with encoded identifiers per EIA ANSI/TIA/EIA-606.

##### 3.5.1.3 Termination Hardware

All workstation outlets and patch panel connections will be labeled using color coded labels with encoded identifiers per EIA ANSI/TIA/EIA-606.

### 3.6 TESTING

Materials and documentation to be furnished under this specification are subject to inspections and tests. All components shall be terminated prior to testing. Equipment and systems will not be accepted until the required inspections and tests have been made, demonstrating that the signal distribution system conforms to the specified requirements, and that the required equipment, systems, and documentation have been provided.

#### 3.6.1 Unshielded Twisted Pair Tests

All metallic cable pairs shall be tested for proper identification and continuity. All opens, shorts, crosses, grounds, and reversals shall be corrected. Correct color coding and termination of each pair shall be verified in the communications closet and at the outlet. Horizontal wiring shall be tested from and including the termination device in the communications closet to and including the modular jack in each room. Backbone wiring shall be tested end-to-end, including termination devices,

from terminal block to terminal block, in the respective communications closets. These test shall be completed and all errors corrected before any other tests are started.

### 3.6.2 Category 5e Circuits

All category 5e circuits shall be tested using a test set that meets the Class II accuracy requirements of EIA TIA/EIA TSB-67 standard, including the additional tests and test set accuracy requirements of EIA ANSI/TIA/EIA-568-A-5. Testing shall use the Basic Link Test procedure of EIA TIA/EIA TSB-67, as supplemented by EIA ANSI/TIA/EIA-568-A-5.. Cables and connecting hardware which contain failed circuits shall be replaced and retested to verify the standard is met.

### 3.6.3 Shielded Twisted Pair

Wiring configuration shall be tested for continuity, opens, shorts, swaps and correct pin configuration; dc resistance both pair-to-pair and wire-to-shield shall be verified. Cable lengths shall be verified. Near end crosstalk shall be tested from 772 kHz to 300 MHz. Ground potential difference between wiring closets, ground potential difference between patch panel and wall outlet, and ground path resistance shall be tested per IBM GA27-3361-07.

-- End of Section --